May 1970

Smithsonian

Many-faceted Peter Scott studies his wildfowl neighbors

Is your advertising drowning in greasepaint?

Making television commercials is fun. You get to watch people running through meadows, and go hear swinging rock groups do your sound track, and throw around phrases like "four-frame cuts" and "rotoscope" and "reverse iris wipe," and if you're really lucky, you even get to go *on location* in the sun!

Making print ads can sometimes be dull. You have to sit, and stare at a typewriter because the words don't sound right. You move the logo around until the client likes where it is, and then make it bigger. And you have to argue more because people who don't know from reverse iris wipes always have opinions about words and pictures.

Dick Coffey, Promotion Director of TIME, recently fired off a memo to his agency which asked: "How come when we review a TV commercial there are always 15 people in the screening room, and when we're trying to close an ad it's just me and the poor damn print production guy?"

But the Dick Coffeys can't be excused, either. Square old clients, with cuffs on their pants and laces in their shoes, get that greasepaint in their veins, too. They go to the locations. They bask in the sun. They dig the scene.

All this leads us to just one question. Granted that TV is a potent advertising medium. But might not the lure of show biz be clouding solid, basic advertising judgment?

Print advertising isn't necessarily fun. But print advertising works. Ask General Electric. Ask Sears. Ask Esso. Ask Clairol.

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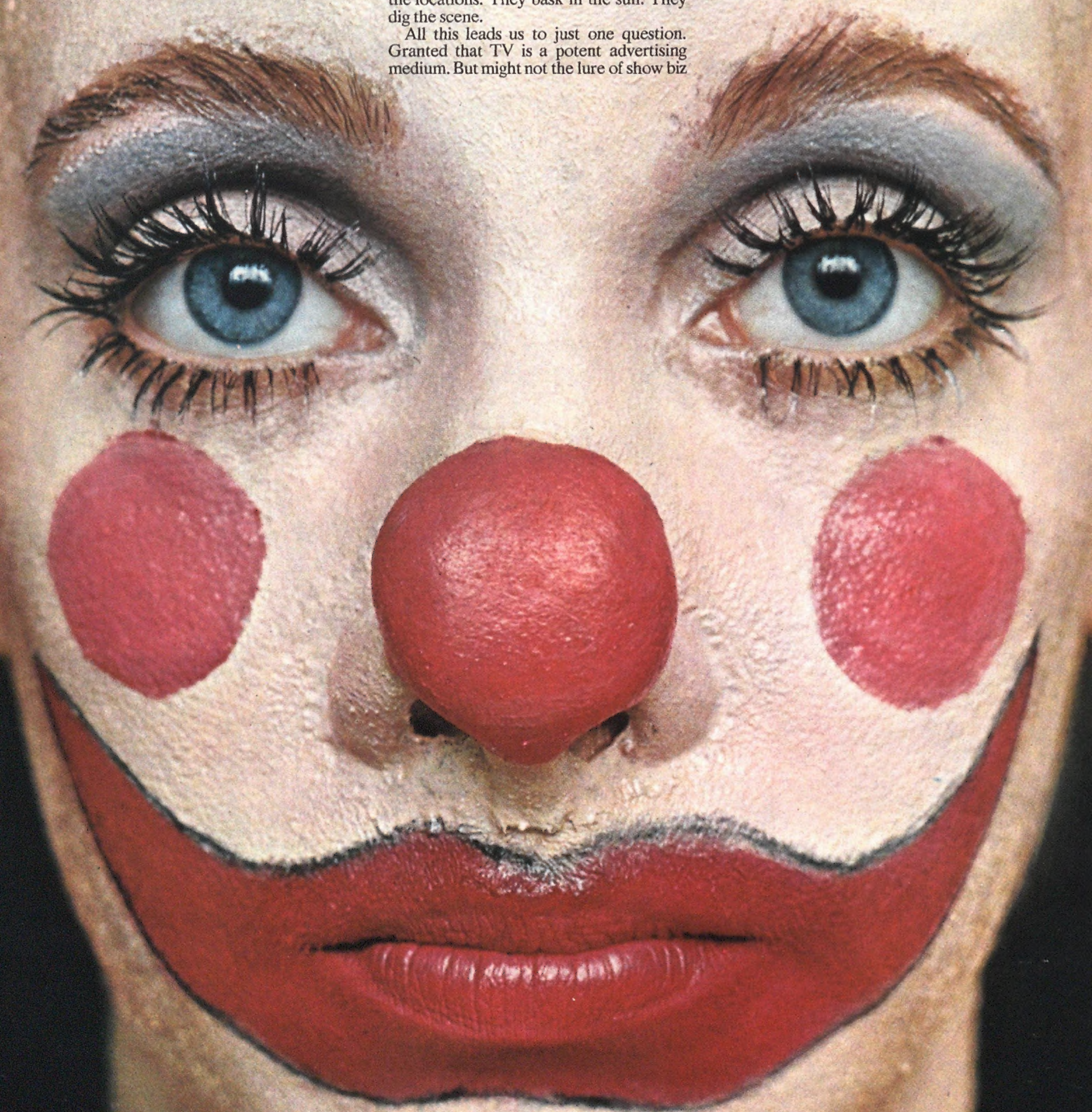

If it's worth a second glance, it should be in magazines.

May 1970

Smithsonian

Volume 1, Number 2

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Secretary Ripley's comments

The view from the castle

Weather prediction is not enough:
what's needed is an early-warning system
to monitor changes in the environment

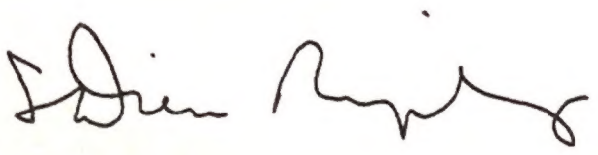
At the Smithsonian science is a continuing passion. If much has changed in the technologies of science, little if anything has changed in the reasons for it. Joseph Henry, the first Secretary, constantly stressed the "increase of knowledge," by which he meant research designed to illuminate truths in nature. One of the Institution's earliest Henry-sponsored programs was a coordinated attack on weather prediction. He assembled a network of correspondents across the nation who would write in, later telegraph, their daily observations, which the Secretary would pin up on the great door of the Institution. Henry's weather reports contained the seeds of modern-day ecology, for they also mentioned natural phenomena associated with climate, apparent changes in plant or animal cycles, migration dates, and so on. When finally all of this was handed over to the infant Weather Bureau in 1873, these correlative embellishments were unfortunately abandoned.

It is interesting to note that in February 1970, at a meeting of the National Academy of Sciences on current environmental problems, a task force—of which Dr. Dale Jenkins, ecologist at the Smithsonian, is vice chairman—was set up to develop a global early-warning system capable of monitoring subtle changes in the environment which might herald critical increases in pollutants (a prospect mentioned by Ralph E. Lapp and Victor Cohn in their articles in this issue). The system would use mechanical monitors, such as satellites, as well as plant or animal "sentinels."

As coal miners use canaries to warn them of deadly methane gas, so certain plants and animals that are acutely sensitive to environmental change—from petunias and tobacco plants to hornets and bird species—could be used to detect increased levels of chemicals in the air and the sea. Two years ago this Institution, mindful of the need for establishing such communications, started a Center for Short-lived Phenomena which already has more than 2,000 correspondents in 122 countries reporting on volcanic activity, earthquakes, meteors, animal migrations and dispersals, sudden animal kills and other phenomena—all of it capable of being tied in with such a worldwide warning system.

Between 1902 and 1907 Dr. Charles G. Abbot, fifth Secretary of the Smithsonian, made measurements in the center of Washington of the total amount of solar radiation reaching that spot—work which continues to the present day. The same measurements made in 1969 show that in 62 years there has been about a 14 percent decrease in the amount of direct sunlight reaching the center of the Mall in the capital. It is assumed, although so far not proved, that the presence of smog is the major causal factor. If so, how much smog can we tolerate or how much sunlight can we afford to lose?

The legacies of science spread through the fabric of our culture like strands of thread through a tapestry. Environmental prediction may be the most perplexing and challenging problem of the coming generation, for around it swirls a multitude of ethical and moral choices regarding the fitness of life for man.



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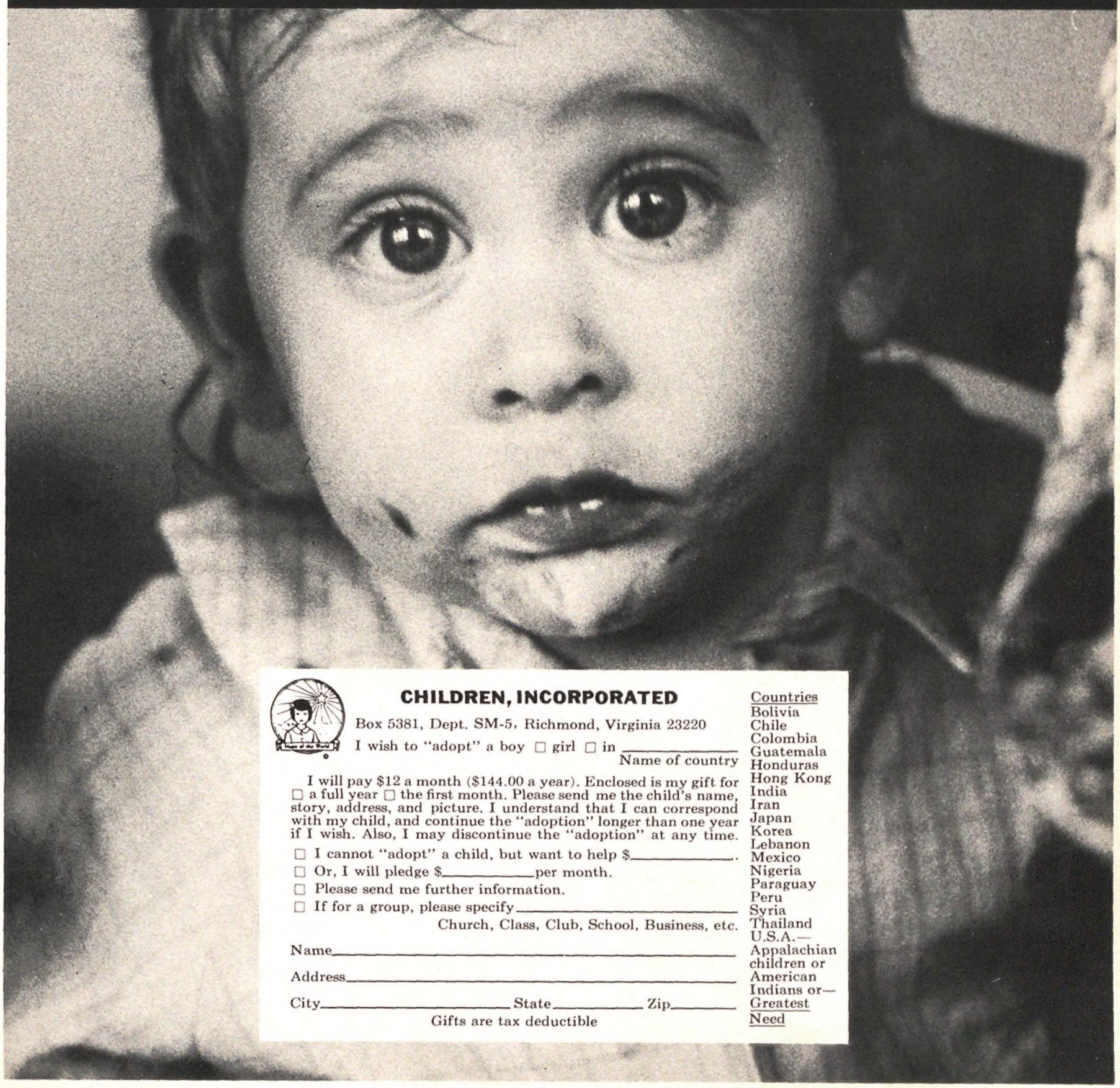

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Thailand
U.S.A.—
Appalachian children or American Indians or—
Greatest Need

By John Tebbel

'Those are Regulars, by God!'

As the President seeks to end the draft
eyes turn to our career soldiers,
long familiar with shouldering our arms

"Militia, you will find, Sir, will never answer your expectations, no dependence is to be placed upon them." So wrote Colonel George Washington during the French and Indian War. Two centuries later, Richard Nixon completed the thought: ". . . we need a highly skilled, highly motivated professional corps. . . ."

The President proposes to end the draft, replacing it with a volunteer army—in brief, Regulars. These have existed and built their traditions since the beginning of the Republic. Even during that miserable military effort, the War of 1812 with Britain, American Regulars proved worthy of battle honors.

In the quickening spring of 1814 our army sought a sudden victory before the British could land 14 regiments of veterans at Halifax. If the infant United States could not win against the British already in Canada and the border country, they would hardly be able to withstand these reinforcements.

A new American general, Jacob Brown, was forthwith instructed to dislodge and defeat the British at Niagara. For this task he had nearly 3,500 men, a force whose core was two brigades of Regulary Army troops, led by Winfield Scott and Eleazar Ripley.

John Tebbel teaches at New York University, writes for Saturday Review *and is the author of many books dealing with history. Proud of his own Indian blood, he wrote* The Compact History of the Indian Wars.

Ceremonial troops of the famed 3rd Infantry parade, according to tradition, with fixed bayonets. But even the 3rd has some draftees these days.

Dressed in militia gray, Winfield Scott's Regulars hold lines at Chippewa as they advance upon the surprised British to win the battle.

Brown attacked Fort Erie and got a quick reaction from the British commander at Niagara, General Riall. Mustering 1,500 British Regulars, along with 600 Indians and Canadian militia, Riall hurried toward Fort Erie and had reached Chippewa, by the creek of that name just above Niagara Falls, when he learned he was too late. The fort had fallen to the Americans. Riall paused to assess the situation.

Next day—the Fourth of July—Scott's brigade began moving and camped for the night not a mile from Riall. Ripley's brigade joined Scott's at midnight.

So these two armies slept with the distant thunder of the Falls lulling them through the hot night. Scott felt secure because it did not occur to him that Riall would risk an engagement against numerically superior forces. Riall rested comfortably because he had no idea such a strong force of Americans was so near.

Next day one of his subordinates, the Marquess of Tweeddale, watched the parading Americans through his field glasses and concluded by their gray uniforms that they must be militia. They were, he reflected, displaying an unusual boldness for militia, but he attributed that to a foolhardy patriotism carried over from the previous day's celebration of independence.

The Marquess was twice mistaken. Scott's Regulars had needed new uniforms before the campaign, but the Quartermaster General had only gray cloth available instead of the regulation blue and, since Scott was not a man who suffered delays gladly, his men were wearing new gray uniforms as they marched into range of Tweeddale's glasses. As it happened, too, the Americans were celebrating independence on July 5th, for reasons never explained. They had been given a hearty noon meal and extra rations of rum, but Scott, always the disciplinarian, refused to let them sleep it off and had ordered a grand parade and review "to keep them in breath." They were on their way to this review, leaving Ripley's more fortunate troops behind, when Tweeddale spotted them.

By this time, an American skirmishing party, fanning out routinely ahead of Scott's troops, had encountered the British and raced back with the news that the whole enemy army was upon them. Scott refused to believe it; there might be a few hundred British on his front but no more. He would disperse them and get on with the review.

Thus the two mistaken commanders approached each other for what would be a fateful battle. Historians differ, but the probability is that it was Riall who, looking through the glasses in his turn, rounded on the Marquess in exasperation and alarm and exclaimed, "Those are Regulars, by God!" No militia, he knew, could have come so cleanly and swiftly into battle positions after being surprised. It was a professional maneuver, perfectly executed.

Sergeant of dragoons of the mid-19th century lines up in winter dress uniform (left) beside an infantry non-com garbed for warm work against the Seminoles. These mannequins stand in the Armed Forces History Hall at the Smithsonian's Museum of History and Technology.

Soon these Regulars, the men of the 11th and 9th Regiments, were fighting the British hand-to-hand with bayonets, and before the sharp engagement ended, the scarlet lines broke and fled. Ripley's men came up too late to fight, and so the American force was actually smaller than the enemy's. As a pelting thunderstorm cooled the disengaged armies, it was clear that the American Regulars had achieved a significant victory. For the first time in the war, they had met British Regulars on even terms—and won.

George Washington would have appreciated that victory. The Revolution had not been won by uncertain militia, although they were not without brave men and deeds, but by the Continental Army, the Regulars. A Washington biographer, the respected Douglas Southall Freeman, tells us how the General rode before the Continental lines on his way to the surrender field at Yorktown—the militia, appropriately, stood behind them—and no doubt saw them symbolizing "the courage that remained when enthusiasm had evaporated."

The fact that there has been loud argument about the merits of a Regular Army as opposed to conscripted militia ever since Washington's day is only further proof of the Regulars' durability as an American institution. They have been with us since 1754, when it became clear that the colonies could neither raise nor hold enough militia to bar French expansion, and both British and Americans realized they would need professionals to fight the intruders.

First American Regulars organized

Within two months of the outbreak of the Revolutionary War, the Continental Congress authorized ten companies of expert riflemen, specifying how they were to be enlisted and laying out a table of organization. These formed the 1st Continental Regiment.

Since then, our Regulars have fought not only in large wars but in the many dirty little wars. Few of these have been dirtier than the endless series of skirmishes, engagements and search-and-destroy missions conducted against the Indians. In these, with the help of white men's diseases, the Regulars succeeded in reducing the Indian population from more than three-quarters of a million, when the colonists came, to less than one-quarter of a million by the end of the 19th century. They had militia help from time to time, but it was the Regulars who broke the back of Indian resistance and eventually ended it.

While this attempt at what is now called genocide remains a black moral page in American history, from a military standpoint it demonstrated what trained, disciplined troops could do, even when the Indian leadership was superior and their forces larger.

It took the Regulars a time to learn. Their first major campaign against the Indians, in the Seminole War which began in 1835, was a hard and bitter experience. An officer corps, trained to fight in the European tradition and passing that tradition on to the men under them, were hardly prepared to counter the kind of guerrilla actions in which the stubborn, elusive Seminoles excelled in Florida's swamplands.

Seminoles bleed the army white

The Seminole War lasted a half-dozen years, fading slowly away into isolated, nasty incidents. The combat chewed up army commanders as though they were as expendable as soldiers, and the strength of the Regular Army was so sapped that Congress was compelled to authorize its increase from 4,000 to nearly 13,000. Some distinguished names lost prestige during the war, including Winfield Scott himself. It took an old Kentucky farmer, hero of the Black Hawk War, Colonel Zachary Taylor, to win his brigadier general's brevet by giving the Seminoles their first decisive defeat, on Christmas Day 1837, beside Lake Okeechobee.

Taylor had a sound plan to counteract the Indians' guerrilla warfare tactics. He proposed to divide up the war arena into districts, put a stockade and a garrison in each one and instruct the commanders to clean up their own territories. Congress would not listen to this plan, however, and Taylor asked to be relieved, whereupon General William J. Worth, a practical man, applied the kind of pressure that won the war. He burned the Seminoles' crops and dwellings, leaving them with nothing to eat and nowhere to sleep except the swamps. Pacification was so complete that Congress thought it safe to reduce the army immediately.

The Seminole War produced a seasoned corps of officers and men, and with them the United States made its first essay in territorial aggrandizement in 1846: the Mexican War. Once more Zachary Taylor was given the assignment. He had an army of Regulars equal to it. A young second lieutenant, Ulysses S. Grant, thought well of this force and years later wrote: "A better army, man for man, probably never faced an enemy than the one commanded by General Taylor in the earliest two engagements of the Mexican War. . . ."

Organization of the troops was improved, and the junior officers, especially the West Pointers, more than made up for the insufficiency of generals. The professionals of the older school, while they had learned a great deal about field action from pursuing the Seminoles, were not quite professional in their larger administrative capabilities. Taylor, for example, was a victim of his own lack of talent for organizing supply, and he was not a notable tactician. Scott was brilliant as a tactician and strategist, but essentially

Painter Charles Schreyvogel here depicts
Western cavalry troopers on "The Skirmish Line."

petty minded. These two, however, towered like giants over the other generals, with the possible exception of Stephen Watts Kearny, who marched from Fort Leavenworth to conquer California.

In the Mexican War, antagonism between Regulars and volunteers began to grow. There is a familiar contemporary ring in Scott's outraged complaint to the Secretary of War: "But, my dear Sir, our militia & volunteers, if a tenth of what is said to be true, have committed atrocities—horrors—in Mexico, sufficient to make Heaven weep, & every American, of Christian morals, *blush* for his country. Murder, robbery & rape of mothers & daughters, in the presence of the tied up males of the families, have been common all along the Rio Grande. . . . Truly it would seem unchristian & cruel to let loose upon any people—even savages—such unbridled persons—free-booters, &c. &c. . . ."

Army fights the "Mormon War"

As a military governor, Scott himself was exemplary, and it may be that the army's first experience as an occupier was helpful when, a few years later, it was called upon to help keep the peace at home. In bloody Kansas, it stood between the free-soilers and those who wanted slavery. Then it marched in the so-called "Mormon War," in which, as historian Ray Billington has put it, "justice and principles of religious freedom were forgotten."

Colonel Albert Sidney Johnston, soon to be marching in the Confederate cause, led 2,500 Regulars into the desert in 1857. They were instructed to impose federal law over a band of Mormon settlers widely believed to be not only lawless but addicted to the morally perverse practice of polygamy. Johnston's men found themselves fighting the kind of guerrilla warfare Scott and Taylor had encountered in the Seminole War, only on different terrain. Mormon guerrillas harassed Johnston's columns mercilessly as they moved toward Salt Lake City, stampeding animals, firing wagon trains and (adopting Worth's tactics against the Seminoles) burning the grass.

As a consequence, the Regulars had to stop their advance against the Mormon capital and go into winter camp at Fort Bridger. Whether they could have dealt with the Mormons as they had with the Seminoles will never be known because, while the Regulars recouped their strength, Mormon militants brought matters to a boiling crisis by shooting down some 140 immigrants passing through Utah on their way to

California. This Mountain Meadows Massacre, as it came to be known, demonstrated the need for immediate negotiation before Johnston's troops and the Mormons could meet head on. Colonel T. L. Kane, the negotiator, convinced the doubters that the government did not intend to interfere with the Mormon religion, only to impose civil law, and Johnston's men entered Salt Lake City without further bloodshed.

Negotiation, however, could not settle the great civil quarrel over slavery and states' rights. Open warfare between North and South broke out in April 1861, and volunteers and conscripts overshadowed the Regular Army, which the government did not attempt to expand on a large scale, as it had in 1812. The Regulars formed the nucleus for the hundreds of thousands of militia and volunteers who flocked to the colors of the Union. Even these were not enough. The Civil War turned the American government to federal conscription and committed it to that method of raising mass armies from then to the present.

There was another legacy left from the Civil War. When it was over, the citizen soldiers who survived went back to their jobs and the professionals took over. They found themselves in a familiar role, chasing Indians and fighting guerrilla actions with them over difficult terrain. In doing so, they established a romantic tradition which became a part of the American legend. The stories survive in a thousand motion pictures and countless television dramas. There is no hardier example of an all-American cliché than the spectacle of the U.S. Cavalry riding over the hill just in time to save the wagon train or the settler's cabin.

The long blue line of cavalrymen, their troop guidon carried bravely in front, is a national image. Military enthusiasts may not know what Regular Army troops are fighting in Vietnam, but they are familiar with Indian scouts, with regiments of a century ago like the redoubtable 10th Cavalry, whose black troopers were called "buffalo soldiers" by their respectful Indian enemies.

Western troops protect a million square miles

This was not the first time the Regulars had been called upon to police the West. Before the Civil War, they were entrusted with the enormous task of protecting settlers in a territory west of the Mississippi covering about a million square miles. Here almost a quarter of a million hostile Indians were spread over the Southwest, the Great Plains and the Northwest. To face them, the largest army Congress authorized was less than 18,000 men. Generally the legislators were slow and niggardly with supplies.

After the Civil War, a different army took the field in the West, composed of both Union and Confederate veterans. Mixed in with these were some hardy adventurers of the kind which always populate professional armies. The troops were multi-lingual and multi-national: Irish, German, French and Italian, among others. It was a bearded and mustachioed army to begin with, since this had been Civil War custom. The torrid heat of the Western deserts, however, made hair uncomfortable in summer, and the winter's severe cold congealed beards into masses of hoarfrost and icicles. Eventually the legion became at least partly cleanshaven. Many troopers compromised in favor of the Texas Ranger mustache, broad and flowing.

Every commanding officer made his own modifications of uniform to fit the conditions under which he was operating. General George Crook's soldiers, for example, looked more like guerrillas than Regulars. An astonished lieutenant fresh from West Point wrote home: "The men frequently discard every item of dress and equipment prescribed or furnished."

Tough troopers of frontier days

The conditions of war on the plains, in fact, did turn these Regulars into guerrillas—a tough, mobile army much admired by military observers from other countries. Their leadership was professional; all officers above the rank of second lieutenant were Civil War veterans. The men themselves could only be called hard-bitten. They fought with each other when no Indians were available and they regularly overflowed the guardhouse on the morning after pay day. Crude and profane, alternately bored and belligerent, they nevertheless were brave and loyal men with a strong feeling for military tradition. They responded unequivocally to the traditionalists who commanded: William Tecumseh Sherman, Philip Sheridan and field grade officers such as Alfred Terry, George Custer, George Crook, John Gibbon and Nelson Miles.

While the Western campaign was at its height, between 1866 and 1875, these officers led their men through more than 200 battles, mostly with the Sioux and their allies and also with the Apaches.

The Indian wars of the West changed character when Washington decided to stop fighting expensive and difficult actions and instead reduce the Indians' mobility by herding them onto reservations. It took some time for the government to put this cruel and unjust policy into effect. The discovery of gold in the Black Hills and the coming of the railroads hastened the inevitable climax, however. When the Sioux uprising collapsed following Custer's still-debated last stand on the Little Big Horn, only a few pockets of resistance remained. Symbolically, the close of the Western campaign coincided with the solar eclipse of January 1, 1889—"the day the sun died," as the Indians

In two world wars, call-up of citizen-soldiers outpaced production. National Guard of 1917 . . .

called it, an event which led to a revival of the ruinous cult of the Ghost Dance and the final embarking of the Indians on the dreary white man's road.

The close of the Western campaigns marked the end, too, of the Regulars' domestic adventures. It was, as the military historian Russell F. Weigley terms it, the "twilight of the old army," a period sometimes also known as the army's dark ages. Even while fighting in the West, the Regular Army shrank in size until it was smaller in proportion to the nation's population than it had ever been. No more than 25,000 men were ever mustered against the Western Indians.

Regulars again—and a few Rough Riders

A new army began to take shape with the coming of the Spanish-American War and the spirit of Manifest Destiny. The explosion of the *Maine* reverberated in Congress with sufficient force to authorize an increase of strength to 28,747 officers and men. This was the nucleus of the army which fought the Spaniards. In Cuba, the main theater, the war was fought largely by Regulars, although the volunteer Rough Riders got a disproportionate share of publicity.

Among the by-products of the war against Spain was the annexation of Puerto Rico. It began at noon, May 10, 1898, when the San Juan shore batteries fired on the *Yale,* one of the American ships which had been cruising ghostlike in the offshore mists. The *Yale* had inadvertently come too close.

These ghost ships were units of the American fleet pursuing fleeing Spanish craft which had eluded the blockade of Cuba. Having been fired upon, the Americans came back two days later and bombed San Juan for three hours. Later an expeditionary force of Regulars under General Miles landed at dawn in Guánica, a small port on the southern coast, and quickly overflowed into the country. These Regulars behaved admirably. They did not harm civilian life or property. Some placed flowers on the tombs of Spanish soldiers killed in the campaign. Their medical officers took care of the enemy wounded. In Hormigueros a group of Catholic soldiers attended mass. It took just 19 days for General Miles and his Regulars to take the island.

Leonard Wood, a prickly ex-Harvard medical student, became army chief of staff in 1910. He outraged the professionals by his insistence on a citizen army as the source of American military strength. "National preparedness," he wrote, "means . . . first of all, the moral organization of the people, an organization which creates in the heart of every citizen a sense of his obligation for service to the nation in time of war." Wood had been commander of the Rough Riders and an efficient administrator in Cuba later.

Those words, and the controversy surrounding them, could be the rallying point today for those who oppose the idea of an entirely professional army. In the calm atmosphere of America before 1914 they fell upon unwilling ears, including those of President Wilson. Then war erupted in Europe, and Wood and his friends launched energetically on their preparedness campaign. The notion of a conscripted mass army, which Wood so ardently advocated, suddenly seemed plausible. Arguing against the voluntary system, Wood asserted that it prevented organized preparation, tended to destroy the individual's sense of obligation for military service and was excessively costly in both lives and money. He contended, in spite of all the evidence to the contrary, that George Washington favored universal military service, and he was fond of quoting Jefferson's remark after the War of 1812, urging "the necessity of obliging every citizen to be a soldier." He even summoned up the shade of Demosthenes: "Go yourselves, every man of you, and stand in

. . . and of 1940 trained with their current designs of weapons. Material remained the same—wood.

the ranks and either a victory beyond all victories in its glory awaits you, or falling you shall fall greatly, and worthy of your past."

A deadlock in Congress over how best to increase the army, and in what proportion of Regulars to others, was broken in 1916 during "the trouble with Mexico." The United States sought a Mexican government which would not interfere with the considerable Yankee business investments in Mexico. Regulars—about 8,000 men of the Fifth Brigade of the 2nd Division—and Marines, mixed about half and half, had followed General Funston to Veracruz in 1914. In 1916, Regulars again—5,000 of them under Brigadier General John J. Pershing—pursued the rebel leader Pancho Villa through the north of Mexico to no effect.

Congress boosts troop strength

As the complicated three-way struggle between the Carranza government, the rebels and the United States went on, threatening full-scale war, the pressure grew sufficiently to force Congress to increase the peacetime strength of the Regular Army to 175,000 over a period of five years, and to 286,000 in wartime. The National Guard, under a new plan, was to be raised gradually from 100,000 to 400,000. As for the concept of universal military obligation, Congress endorsed it by defining "Militia of the United States" as all males between 18 and 45, divided into National Guard, Naval Militia and unorganized Militia.

The Selective Service Act of May 18, 1917, ended further argument in wartime America. It gave the President power to raise Regulars and National Guard to full war strength, and to draft 500,000 men. Another 500,000 were authorized at his discretion.

Since then America's wars have been fought largely by conscripted men, although the Regulars have carried on their tradition of service. Just how long and faithfully they have served is clear from only a casual glance at Army "Lineage and Honors."

There is the 3rd Infantry, for example, the "Old Guard," organized first in June 1784 as the First American Regiment and consolidated officially as the 3rd in 1815. It fought with Scott at Chippewa in 1814, and from Palo Alto to Chapultepec in the Mexican War. It stood against the Seminoles, the Comanches, the tribes of New Mexico and Montana and others in the Indian wars; appeared at Bull Run, Peninsula, Manassas, Antietam, Fredericksburg, Chancellorsville, Gettysburg, and Appomattox in the Civil War; at Santiago in the Spanish-American War; in the Philippine Insurrection; in France in World War II; and now has troops in Vietnam.

Oldest unit dates from 1636

The records of the others are much the same, and their names are more familiar today than they once were. The elders, if not their young, remember the 3rd Armored Cavalry's deeds in France and the Rhineland after D-Day in 1944. The 7th Cavalry fought not only at the Little Big Horn against the Sioux, but in New Guinea, Leyte and Luzon in World War II, and through the entire Korean War.

One of the oldest American units is the 182nd Infantry, organized in 1636, from such existing training bands as the North Regiment, including citizens from the towns of Charlestown, New Town, Watertown, Concord and Dedham, Massachusetts. This company became the Regiment of Middlesex in 1643, and it fought most of the Revolution as the 7th Massachusetts Regiment Continental Line. In the Civil War it was at Bull Run, in the first World War at Meuse-Argonne, and in World War II at Guadalcanal and the Philippines.

Today President Nixon raises again the question Leonard Wood thought he had settled in 1916. Mr. Nixon seeks to prepare for a gradual change from draftees back to Regulars. The draft would not be completely abandoned but merely put into cold storage as a standby measure.

Even this conservative proposal has stirred up a controversy. The arguments of Washington's time have been repeated, but some contemporary objections have been added. The draft "reform" of 1969, instituting a lottery system, only succeeded in creating further confusion. Public opinion polls show Americans now prefer a voluntary army over the draft. The steady pressure toward the creation of a professional army continues.

At the root of it is the rebellion of youth against not only the war in Vietnam, but against wars of any de-

scription. The revolt began on the campus but is now in the camps and even, mildly, on the Vietnam front itself. There are at least three G.I. activist groups in operation, opposing the war, and the underground press on military posts has grown surprisingly.

These and other symptoms suggest that in the new social climate of America the draft will have to go eventually, if for no other reason than because those who are about to die are no longer prepared to salute and go willingly in anything like the numbers we have known before. These young men will shortly comprise an overwhelming number of voters.

Americans have never liked the idea of a standing army. Yet the kinds of wars the United States is likely to be fighting in the forseeable future, if the madness is never to stop, are not likely to be the kind which demand the large conscripted armies of the past. Only confirmed militarists and myopic patriots do not believe a nuclear conflict would be over before the first draft call could be issued, and quite probably before humanity could even say its farewell prayers. A more likely future includes dirty little wars America has always fought, from the swamps of Florida to those of Vietnam. For these if they must be waged, the small, tough, professional army is ideal.

Is the draft unconstitutional?

Those who favor the Regulars as our only military force sometimes argue on libertarian grounds. It would be difficult to increase that army without the approval of Congress, they say, and consequently strong-minded presidents would find it difficult to go to war without a declaration, as has happened in Vietnam. Further, the Pentagon's power would be curtailed because if it wanted to expand the armed forces, suddenly and rapidly, it would have to go to Congress for the money, and the days when Congress is willing to give the Pentagon more than the budget allows appear to be waning. The proponents of a professional army also have a Constitutional argument, although specialists in Constitutional law do not take it seriously. Under the 13th Amendment, these proponents claim, a drafted man has had his Constitutional rights violated since this amendment prohibits "involuntary servitude."

Those who defend the draft call themselves practical men. They say, still bemused by past wars, that it would be impossible to *recruit* an army of two-and-a-half-million men, if that were necessary, no matter how much they could be paid. They agree that military life is repellent to an increasingly large number of Americans, and therefore they argue that compulsion is the only way to produce large bodies of men.

This debate is closely allied with the cost of a professional army, about which there is the widest possible difference of opinion. The Pentagon has speculated that it would cost anywhere between $4 and $17 billion more than the present conscript army. A special commission asserts that it would be no more than $3 to $4 billion. It says that the cost would decline in time because those who made the army a career would produce savings in training, paperwork and benefits.

Inducements for whites as well as blacks

In the background, of course, are whisperings and insinuations that an American professional army would turn out to be black. But this is doubtful if the proper inducements—in pay and education—were offered for enlisting. If the military made the services truly attractive in peacetime, they would attract both whites and blacks.

There are fears, finally, that the professional army, if created, would be fighting wars in distant places. Far from any emotional ties with the people back home, it might well be indifferent to what it was doing. The men would be resentful and eventually either dangerous or indifferent themselves. This idea, however, rests on a series of doubtful historical parallels, as does the proposition that citizens ought not to be "deprived" of their "right and obligation" to defend their own society. George Washington had some strong thoughts on this point; the situation has not changed as much since the Revolution as some believe.

There are, presently, two primary bills before Congress that would create a voluntary army of Regulars. One is S. 503, introduced in January 1969, by Senator Mark Hatfield, and backed by such unlikely philosophical partners (although each for different reasons) as Senators George McGovern and Barry Goldwater. The other is H.R. 13379, introduced by 15 members led by Representative Allard Lowenstein, the liberal New Yorker, but also including more conservative support. Liberals and conservatives back these bills for widely different reasons; the President supports them for purposes both political and practical. As these words are written neither has passed, and no one can be sure that a professional army is just around the corner. What we can be sure of is that the armed forces are going to undergo the most drastic overhaul in their history before long and, when it is over, the Regulars, by God, will still be marching on.

In the muck of Vietnam, men of the 3rd Infantry,
draftees mixed with Regulars, uphold honor
of the "Old Guard," earned in many grim,
dirty little conflicts since the Revolutionary War.

By Henry M. Jackson

What Congress must now do to save the environment

Now that we have a declaration of national goals and policies, the need is for a wide range of legislation to implement it

Senator Henry M. Jackson (D., Wash.) is the author of the historic National Environmental Policy Act, and is shown on a fishing expedition in the Cascade Mountains in his own state.

When our federal Constitution was written, there were not yet four million people in America; today there are over 200 million. In 1933 our Gross National Product was $55.6 billion; in the fourth quarter of 1969 it stood at $952 billion. This is not the whole story, however. While our population has increased by 70 percent since 1945, newsprint consumption has increased by 170 percent, the horsepower of our machinery by 350 percent and aviation fuel consumption by 1,500 percent. The question we face today is: Can we live with the changes we have brought about and the changes that are projected for the future?

Fortunately, over the last few years we have made some significant legislative progress toward the development of intelligent long-range public policies on environmental administration. The movement of government from the role of "arbiter" among conflicting resource interests to the role of "trustee" for the environment as a whole is still far from complete.

Many of the environmental aspirations and desires of the American people were written into law in the "National Environmental Policy Act" which the President signed as his first official act of 1970. This measure provides a Congressional declaration of national goals and policies to guide *all* federal actions which have an impact on the quality of the environment, but full implementation will require a wide range of legislative action by the Congress.

The next logical step, and a most important one, is to develop a national land-use policy. Many existing problems involving congestion, ugliness, noise, lack of open space, and air, water and solid waste pollution are directly attributable to past shortcomings in land-use management. Regulation and control of the land is essential if real progress is to be made in achieving a quality environment, but it will require other spe-

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By Victor Cohn

But who will pay the piper and will it be in time?

Fighting pollution is costly, urgent, and everyone is for it—but like other crusades it is in danger of being talked to death

We have finally set out to rise from the muck, to halt pollution and cleanse the world. Or have we? There are many reasons to conclude that we have not yet made a true start.

On February 10, to be sure, President Nixon called for a "total mobilization" against pollution and the most far-reaching environmental program yet proposed by any President. "Ecology," says California's Jesse Unruh, "has become the political substitute for the word 'mother.' " And Senator Edmund Muskie adds: "In the past we had to fight against all kinds of political pressure, public apathy and ignorance. Now the wind is blowing at our backs."

Hallelujah! Even Dr. Barry Commoner—outdone by no one as an ecological Jeremiah (with a high average for accuracy)—now states, "I think there's some hope. I think we may barely make it if we organize all our resources to support human needs."

So far, however, we have seen mainly the words. All the essential actions, though sincerely promised we will concede, are still to come.

On March 11, 1964—remember?—President Lyndon B. Johnson pledged an equally resounding "unconditional war against poverty," to the same sort of hosannas. We have heard similar declarations of war against racial inequality, against unequal education, against urban squalor and against war itself. The typical pattern of the New American Crusade is words followed by ill-funded and inadequate programs followed by disillusionment followed by apathy. What makes us think we can now avoid the same route?

True, we sent men to the moon, but that was technologically simple compared with assaulting pollution. This job demands not a nicely delimited, eight-year, $25-billion program, but a far more expensive, everlasting effort dictating profound changes in the lives of all of us.

The job must be accomplished by most of the same individuals and officials who have been doing or permitting the polluting. In 1965, for example, Congress enacted what seemed to be a strong and far-reaching joint federal-state water quality program. Today the nation's waters are even dirtier, and negotiations are still going on with many states over adequate goals.

Many industrialists, such as Henry Ford II, have impressively pledged themselves to the environment. But we kid ourselves if we think that industry as a whole—with "low-cost production" its lifeblood—will passively swallow expensive measures. Company after company is already scrutinizing the fine print and counting the costs in the new enforcement bills now being written. The pressure on Congress for loopholes for this or that state's crucial industry, and crucial jobs, will be huge.

"Ecology is the most perishable item to come along in years," says Dr. Harvey Wheeler of Santa Barbara's Center for the Study of Democratic Institutions. "We've got a program to invent a new name for ecology, so we can keep it alive after it's been talked to death."

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cific legislation. Some of the most important of these measures include:

► A "Surface Mining Act" to regulate those industries that strip the mineral wealth from the land, leaving behind a desolate waste, desperate water pollution problems and impoverished communities;

► A "National Open Beaches Act" to preserve for public use more than the present five percent of the nation's 21,724 miles of recreation shoreline;

► A "Federal Surplus Land for Parks and Recreation Act" to make idle lands available for public use at little or no cost to local communities;

► Legislation to set aside additional national park and wilderness areas before they are lost to industrial, commercial or residential development;

► Amendments to the Land and Water Conservation Fund to provide increased monies for state and federal acquisition of recreational lands.

But the challenge of the land, important as it is, must compete with other legislative priorities. One of the most urgent is the development of means to bring population growth, worldwide and at home, into balance with the earth's limited capacity to support life.

In the United States, however, the crowding, congestion and deterioration of public and private services are as much a product of population distribution as of population growth. As of the 1960 census, 70 percent of our population was crowded into one percent of the land. The percentage has been increasing, and it is expected that by the year 2000 almost 85 percent of all Americans will live—whether they want to or not—in our already overburdened cities. So new towns must be created on the public lands and existing small communities revitalized, but legislation will be required to do it.

For many people, environmental degradation means foul air, dirty water and the discarded waste of an affluent society which subsidizes and tolerates planned obsolescence. These are the nation's most costly and pressing environmental problems. All have been the subject of federal programs for a number of years. There is adequate technology to deal with water pollution, but the problem has been lack of money. We need to increase authorizations and provide for full funding of existing programs.

The technology of air pollution control is not as advanced, so here we need legislation to require increased research and a more careful consideration of alternative energy sources. As for solid wastes, the problem is to find solutions that do not result in exchanging bad for worse, such as burning wastes or dumping them in the ocean; legislation has not yet been enacted to move beyond the present federal research and planning assistance program into federal grants for construction of facilities to recover and recycle wastes. It merits early action.

Some of the other environmental legislative priorities facing the nation include:

► Development of a national transportation policy which takes into account environmental values;

► A comprehensive and up-to-date revision of the mining, right-of-way, and other public land laws which were designed for 19th-century conditions, not the latter one-third of the 20th century;

► Consideration of the need for an overall national energy policy, surveying *all* alternative sources from both an environmental and economic point of view;

► Development of new procedures to allow for the widest possible public participation in decisions concerning the future of our shared environment, accompanied by an increased effort by government agencies to obtain international cooperation.

While all of these measures are urgent, one of the most important is new legislation to enlarge the U.S. role in cooperative international efforts in the administration of the world's environment.

A critical need for better information

One of today's most critical needs is for better environmental information. The National Environmental Policy Act authorizes and directs all federal agencies to develop new methods of analysis which would lead to a more realistic evaluation of the social costs of private and public actions. In the past these costs have simply been ignored.

If the American people and mankind in general are to resolve the environmental crises we face, every person must develop a new ethical sense of his relationship to and his dependence upon the natural world. Our success will determine mankind's ability to continue to inhabit the earth.

Victor Cohn, continued

All these are dark facts. There is also a bright one. People are complaining. What Harvard ecologist Frederick Smith calls "the wrath of the people" has at last exploded. Little Trenton, Maine, badly in need of new taxation and jobs, voted 144 to 77 to reject a new aluminum reduction plant and nuclear power station. A Houston TV station asked listeners to comment on the air on local pollution; it got 80,000 responses.

Why today? Perhaps it was the photographs of those pathetic oil-soaked birds at Santa Barbara that first woke up the country to the fact that the mess is everywhere. Passing south of Chicago, you have to roll up your car windows. Open an apartment window in downtown Washington, a non-industrial city, and you get a roomful of soot. "Just look around," says a University of Minnesota co-ed. "The air, the water, the roadsides—everything stinks." An Indiana girl says: "There are no pretty days in Terre Haute."

Indeed, the kids—newly incensed about the environment as they have long been incensed about the war—seem to have found a cause that unites campus longhairs and squares, as last month's nationwide demonstrations proved. Ask them, "Why *now?*" and many complain of a "system" that, in permitting war, in oppressing blacks, in fouling the earth, always seems to them to put people last.

The politicians are listening. Governors and legislative leaders in virtually all the states have put environmental bills at or near the top of this year's priority list. A quarter of the bills before the current California Assembly deal with pollution control.

So we're all in the battle. In the immortal words of Pogo, quoted about every other day on this newly popular subject: "We have met the enemy and they is us."

In all of the talk and the programs so far, however, there has been mighty little "us." Most of us piously say "they" must cut down on pollution, "they" must clean up their plants, "they" must build better cars. There is still deep failure in most quarters—including the statehouses and the nation's capital—to grapple with the fact that it will be costly for all of *us,* will bear down on *our* present liberties, force *us* to reduce our consumption of inevitably polluting luxuries like gasoline and electricity and force *us* to limit population, not just in distant India but in our own families.

We have no choice but to try. It is fashionable in some circles still to scoff at those who say we may have "only 15 or 30 or *x*" more years before mankind may be irretrievably doomed. Yet this globe has witnessed the extinction of many species; there is no reason why man should be magically exempt.

Ecologists are worried about the future of the oceanic phytoplankton, which produce some 70 percent of our oxygen. They are worried about mass deaths in cities (Los Angeles public schools forbid children to exercise on some days lest they inhale too much smog).

Melting icecaps or a new ice age?

Some oceanographers say that at present rates of pollution—by sewage sludge, by oil-drilling and spills, by man's chemicals—the continental shelves of all major oceans will be so fouled that oceanic productivity "will be essentially over" in perhaps as few as 25 years. Atmospheric scientists are increasingly worried about rising levels of atmospheric carbon dioxide, put there by proliferating, fuel-burning man. The result is a "greenhouse effect" that may make the planet warm up—melting icecaps and flooding coastal cities—*or* may reflect away sunlight, causing a new ice age. Just what will happen no one in fact knows, but one scientist feels sure there will be "dramatic effects"—reduced snowfalls perhaps, reduced river flows, melted glaciers —"within 50 years" if world population and fossil fuel burning keep increasing.

Barry Commoner (just as a "wild estimate," he admits) thinks we may have only until the end of the century—the point when today's world population of 3.5 billion may reach 7 billion—to halt further population growth and pollution or so disturb the phytoplankton or some other part of the ecosystem "that we will have had it." Some scientists think this is extreme. But the world's population will double every 35 years after the year 2000, if it continues at the present rate. No one thinks the planet can survive this for long.

The only question then is: What do we do? Where do we start?

The answer is fairly simple and, in a political world, political. We have to start by enacting the kind of programs Mr. Nixon asked, and, if they are not

enough, be prepared to build and expand on them—instead of quickly abandoning them as "failures" as is our wont (example: the war on poverty).

We need to enact at least the nationwide air and water standards which the President asked, and at least his proposed penalties, which are up to $10,000 a day for industrial or civic polluters. But even $10,000 a day (or more than $300,000 a month) may not deter some major polluters (it's less than paying eight percent interest on a $45 million loan for new equipment). This means other penalties will be required, including jail sentences, if needed, for defying court orders. Tough enforcement, not just new laws, will be the real test of federal purpose. For enforcement, not law, has always been anti-pollution's main weakness. When a federal prosecutor recently cited an 1899 law in moving against Midwest water polluters, Ralph Nader asked: "Why wasn't it enforced for 71 years?"

How "enforcement" is working today

New York law said that 3,420 New York City apartment-house incinerators had to be upgraded or shut down by December 1968; as of January 1970, more than 1,900 (500 of them operated by the New York City Housing Authority itself) were still burning. As of last October, owners of 5,910 more were required to comply; as of January 1, 4,700 were operating. In Philadelphia last December, the Municipal Court disposed of a set of alleged air pollution violators as follows: "Philadelphia Electric Co., fined $6 (court costs); General Smelting Co., discharged; Celotex Corp., $6; National Steel Drum Co., $300 (the maximum fine)" etc. "The first three," noted the *Philadelphia Inquirer,* "are among the 15 major sources of air pollution identified by the city last year."

In such situations, it seems plain, a higher government must be prepared to move in on laggards. Similarly, far stronger regional authorities are needed—to revive, say, a Lake Erie, bordered by four states and Canada and now threatened with new gas and oil drilling. Or to arbitrate the mounting problem of municipal solid waste disposal. Every city is running out of dumping space and looking elsewhere. Who is to coordinate all the elsewheres, and prevent some small town from permitting the filling-in of a precious wetland just for some easy revenue?

Often, again, federal coordination and control will be the only possible "regional" authority. But federal policy itself has been a crazy quilt. The Interior Department tries to acquire wetlands and waterfowl areas for conservation purposes; the Department of Agriculture subsidizes drainage projects to dry them up. Health, Education and Welfare condemns foods high in pesticide residues and recommends pesticide curbs; Agriculture resists wholesale bans on pesticides.

We may need a whole set of new tax policies at all levels to assist the process—to penalize polluters, for example, by assessing them for pollution; to encourage land preservation rather than encouraging endless development. Each year the United States is paving over one million acres of oxygen-creating vegetation. "We cannot afford this" just in terms of fresh oxygen to breathe, warns Dr. LaMont C. Cole of Cornell.

"Pollution taxes" or not, cleaning up the environment will take money. We need to be prepared to pay a heavy price, though the "savings," in a cleaner, more livable planet, will be priceless.

Thousands took part in the first of campus environmental teach-ins at Ann Arbor, Michigan.

The immediate price? The United States, in federal, state, local and industrial funds, has been spending about one percent of the Gross National Product, or about $10 billion a year, on pollution control. (Half is consumed just by municipal waste collection.) The federal share in fiscal 1969 was under $1 billion. The President has mainly proposed adding $4 billion over four years, to supplement the communities' $6 billion, a total of $10 billion worth of water-treatment plants. Senator Muskie would have the government instead obligate $12.5 billion over this period, with states and localities matching it for a $25-billion total. The Federal Water Pollution Control Administration has estimated that bringing lakes and streams to federal standards by 1973 would truly cost from $26 to $29 billion.

Economists of the Organization for Economic Cooperation and Development think it would take a steady annual outlay of two percent of GNP (just under $20 billion in the United States) for an industrial nation *merely* to keep environmental deterioration gradual; that it would take a regular four percent to hold the line; and that real clean-up and prevention would cost "three or four times as much," or a U.S. minimum of $120 billion a year.

All these are guesses. There is undoubtedly much that can be done cheaply. We can probably develop lead-free gasoline for an added four cents a gallon at most; we can probably drive something close to pollution-free automobiles for an extra $300 to $500 apiece. One estimate says a $700-million annual national charge for "drastic" control of industrial and power-plant pollution would add "a mere 20 to 30 cents" to most users' monthly electricity bills. But Dr. S. Fred Singer, deputy assistant secretary of the Interior for scientific programs, is not as optimistic. As U.S. population rises, he believes, anti-pollution costs will rise even faster. The American taxpayer, he fears, will soon refuse to pay them, preferring pollution.

This means that we may soon have to decide a question far more basic. If we would really keep a clean planet, we first must decide what kind of society we want.

We can have anti-pollution auto engines, but they will still have to run on some kind of energy, which will require mining or offshore oil drilling or electric plants. Can we really afford to let individuals have cars at all? Or all the cars they can buy?

We may have to go back to being hot in summer

We can build lower-pollution electric power plants at acceptable cost, very probably, for a while. But even they will cause some pollution and require smokestacks that tower over landscapes and peaceful rivers. U.S. power needs are now doubling every ten years, far faster than the population. Can we really let everyone consume all the electricity he wants—for electric typewriters, electric pencil sharpeners, electric can openers, hair driers, knife sharpeners, shoe polishers? Do we really need endless miles of neon signs, scarring the roadsides and confusing drivers as well as eating up scarce energy? Do we really need air conditioning on days in the pleasant '70s, just because big buildings are now being erected with sealed windows (to keep out the pollution that this overuse of energy causes)?

Can we indeed ecologically afford endless economic growth? The voracious United States, with 5.7 percent of the world's people, already consumes 40 percent of its resource production and spews out 50 percent of its industrial pollution. Isn't there some point where the factories have to stop growing, where we say, "This is the richest living, the largest production of goods we can ecologically tolerate"?

Harvey Wheeler thinks the United States may reach the point in just ten years when "the present growth rate is absolutely disastrous and economic growth may have to be abandoned altogether." According to Dr. William Pollard, director of the Oak Ridge Associated Universities, we must face the fact that the Industrial Revolution's "joyride" is almost over.

There are some signs that some people are ready. Many of the kids are deriding our "junk culture" and saying they are ready to settle for less. Astonishing all observers (and oil company lobbyists), the Maine legislature recently overwhelmingly voted statewide industrial zoning and tough new bills to control indus-

trial development. It required the oil industry, for example, to pay unlimited liability for oil spills, plus a half-cent environmental levy on every barrel of oil moved in or out of the state. It did this despite intense industry interest in building refineries on the Maine coast, interest that would have been greeted with open arms and easy rules a few years ago.

But the issue of economic growth versus environmental quality will not go away so easily. Economist Walter Heller believes that prosperity without economic growth is unthinkable, and that continued growth will in fact be mandatory if we are to pay for pollution control.

Black militants are calling environmental concern a "cop-out" and "white middle-class toy," designed to steal attention from poverty. *Newsweek* quotes a black steelworker who is rearing his family in the dubious air of Gary, Indiana: "It's the bread, man. Hell, I'm getting $5.50 an hour."

The only possible answer here is a larger definition of "environment." Harvard's Dr. Smith says: "Environmental quality and human welfare are not two independent evaluations," but "two views of the same system. . . . It is not possible for one to remain good while the other is bad. . . . Under this broad definition of environment all of the ills of man emerge as environmental problems."

So we need only reform the world, a task that has eluded man for all his years.

We very badly need knowledge. Knowledge is lacking today to answer many of the most basic questions about the environment.

A study board of the National Academy of Sciences in January accordingly recommended three steps: (1) a day-to-day national program to monitor pollution; (2) creation of a National Index of Environmental Quality to measure the purity of air and water, the uses of land and the state of various animal species; (3) establishment of a National Laboratory for the Environmental Sciences.

We need answers to many questions. The $10 billion in sewage plants the President wants to finance will put clean-looking effluent into the rivers all right, but the effluent will be rich in both phosphorus and nitrogen compounds that promote plant growth and eutrophication—or death—for rivers and lakes.

We desperately need better ways of waste disposal than burning and dumping, which either create new smog or fill in our last wetlands or create new dead zones at sea. The only possible answer is recycling: reusing everything; building in new charges or subsidies to make this profitable; putting every product in a reusable or reclaimable container. But today there are a thousand competing and often half-baked recycling ideas. These need research and development programs on a scale not yet even considered—perhaps under something like a reconverted NASA with a new national goal: to put man on a clean earth in this decade.

The perils of using hand-picked consultants

To understand all we are doing and will yet do to the environment, we need advance examination of our massive assaults on the limited earth. A case in point: In 1969 the Atomic Energy Commission said a "safety review" foresaw no substantial risks in hugely expanded underground nuclear testing, even near the earthquake-prone West Coast and in the unstable Aleutians. Dr. Kenneth Pitzer, president of Stanford University and former A.E.C. research director, demurred. He did not disagree with the A.E.C. finding, but he urged study of such an important matter—where mistake means disaster—by "an impartial judge and jury" of independent experts outside the A.E.C.

We should follow the same practice, Dr. Pitzer argued, in many decisions that affect earthly ecology—instead of making them in closed circles, in unpublicized meetings, by government officials and closely-linked, often hand-picked consultants.

We face many such ecological decisions today:

In transportation, for example. We have poured billions into highway development but almost nothing into developing other ground transport. Travelers today may spend one hour flying from Washington to New York, then five hours circling in the air, waiting on the ground and finally traveling by various means a distance of 30 miles. How long must we wait for an ecologically sane transport system?

Energy production is another such area. Citizens of Minnesota, Maryland, Maine, New York, New Jersey and elsewhere are now demonstrating and making

strict rules against the radioactivity of nuclear power plants. At the same time, citizens of California are legislating against dirty fossil power, and complaining of tardy development there of cleaner-seeming nuclear power. Which will really do the least harm to a particular environment? Can't someone say?

Then there is our use of precious land. To preserve open land, we may have to make the federal government its major controller—perhaps in the indirect way now being suggested by Senator Henry M. Jackson. We also need planned towns instead of uncontrolled sprawl—including experimental cities, some scientists believe, to test new ways of closed system sewage control and water reuse. Who is now planning these?

All such decisions and more require "technology assessment," but do not now get it, though we put up whole "new cities" in haphazard fashion every year. However we do it, if we ever do—man does not always do the rational thing—it will still not give us perfect answers, only the familiar imperfect alternatives, but we will have to get used to that.

For we must see now that there are no perfect solutions to most of our technological problems. Science is a wondrous servant, but it cannot do everything. We will never again see the earthly environment of 1900 or even of 1950.

We will not even maintain the environment of 1970, however, unless we face the most basic question of all—the one we all tend to face last, if ever. How many children can we allow future parents to have? "Allow" means not only persuasion and social and economic engineering, but also harsher measures like severe tax laws, if necessary.

A crusade launched with earrings

Last June a dignified 20-year-old named Miss Stephanie Mills (quoting *The New York Times*) "jarred the Mills College commencement at Oakland, California, by announcing, as valedictorian, that she did not intend to bring any children into this muddled world." Miss Mills (above right) appeared at Stanford in November to address students meeting to form an environmental federation. Having become a worker for Planned Parenthood, she now wore a conspicuous set of curlicue-shaped plastic earrings: intrauterine contraceptives. Fine. For her. Yet most of us would still say, IUDs yes, childlessness no. Otherwise we concede that man's extinction has already begun.

What we may have to accept, many scientists believe, is zero population growth by about the year 2000, when world population, it seems, will inevitably be doubled no matter what we start doing now. What we will have to accept *now* to affect population growth later, many demographers think, is the family

Stephanie Mills began her own campaign for population control at her commencement last June.

of two as a universal limit. Will establishing zero population growth and the two-child family require more coercion than social measures or taxes? We can only hope not, while saying deep inside, "Probably—some unfine day."

Our only alternative, in the phrase of Margaret Mead, would be "a new planetary ethic," one that would say: we *cannot* overpopulate, we *cannot* overconsume, we *cannot* pollute.

It is certain that we are not all going to start to wear IUD earrings, to say "We cop out." It is equally certain that individual morality, not just the law, is required to curb the deadly litter that each of us generates. It is equally certain that we must begin to move far past the President's February message if we would leave our children an earth.

An exhibit of Chatsworth's old master drawings

Selected works from England's superb Devonshire collection are currently on an extended visit to these shores

What is probably the greatest collection of old master drawings still in private hands is owned by the Duke of Devonshire and housed at Chatsworth in Derbyshire, a splendid Palladian pile built at the end of the 17th century. Although thousands of tourists visit Chatsworth every year, they usually get no more than a glimpse of these treasures, for it is still a private home and most of the fragile drawings are kept in dustproof cases. So the fact that a representative selection of them is currently circulating in North America is not only a rare opportunity for fanciers of drawings, but something of an Occasion as well.

The collection itself was largely assembled by William Cavendish, the second Duke, who began buying drawings even before he inherited the title in 1707. His most important purchase was the acquisition in 1723 of the collection of Nicolaes Anthoni Flinck of Rotterdam, which brought him a matchless group of Rembrandts, Rubenses and Van Dycks. But he bought so well throughout his life that, with the exception of Michelangelo, hardly a great name from the beginning of the Renaissance to the end of the 17th century is not represented.

The second Duke's great achievement remained intact at Chatsworth through the vicissitudes of more than 200 years, vulnerable in the end only to 20th-century inheritance taxes. In the 1950s a substantial number of drawings by Claude and Van Dyck and one by Holbein were handed over to the British Treasury in partial payment of the death duties on the estate of

Albrecht Dürer: *The Virgin and Child with the Infant St. John,* pen and brown ink, probably 1518.

Anonymous Italian: *A Hawfinch,* water color over black chalk, mid-16th century.

Raphael: *Study of One of the Marble Horses of the Quirinal,*
red chalk with measurements in pen and ink.

Rembrandt van Rijn: *View on the Bullewijk, Looking towards Ouderkerk,* pen and brown wash, c. 1650.

Sir Peter Paul Rubens: *Sketches for a Wolf-Hunt,* black and red chalk and water color.

Marten van Heemskerck: *The Entrance to Old St. Peter's and the Vatican Palace,* pen and brown ink.

Il Parmigianino: *Head of a Boy in Profile to Right,* pen and brown ink.

the present Duke's father. Even so, the collection remains an extraordinary monument to the taste and style of a great 18th-century nobleman.

The exhibition of "Old Master Drawings from Chatsworth" was organized by Annemarie H. Pope of the International Exhibitions Foundation. It opened at the National Gallery of Art in Washington last November and has since been seen in Philadelphia, New York and Toronto. Still to come are the Art Institute of Chicago, May 9-June 7; the Los Angeles County Museum of Art, June 20-July 19; the M. H. de Young Museum in San Francisco, August 1-31; the Nelson Gallery of Art in Kansas City, September 15-October 18; and the Rhode Island School of Design in Providence, November 1-30. As with all exhibitions of important but infrequently seen works of art, this one provides an opportunity for scholars to revise earlier judgments. Thus, in the catalog prepared for the show, the beautiful drawing reproduced on page 24 is firmly attributed for the first time to Raphael. It may be challenged, but that is part of the dialogue of scholarship which exhibitions like this promote.

All drawings Devonshire Collection Chatsworth. Reproduced by permission of the Trustees of the Chatsworth Settlement.

Francesco Vanni: *A Woman, Half-length, and Other Studies,* black and red chalk.

Article and photographs by Carl Mydans

The ominous blooms of Japan's beloved bamboo

Tiny flowers sprouting from the madake
signal not the approach of spring
but the kiss of death. Why, no one knows

Visit a cultivated bamboo grove in Japan and you find yourself in a cool, dark-green world of extraordinarily pleasing forms: slender towers rising over the gentle undulating land in symmetrical parade. I entered such a grove (at left) with Takeyoshi Suzuki, principal researcher of the Silviculture Division of the Government Forest Experiment Station at Kyōto, and had the odd impression that some kind of marching life had come to a halt and was standing at attention.

The Japanese say that when Izanagi, one of their creator-gods, flung down his fine-tooth comb, a clump of bamboo sprang from it.

Gifts of bamboo plants were apparently brought to Japan from China in the 6th or 7th century and their cultivation has since lent the countryside a feathery touch. Today, the Japanese probably know

Inconspicuous flowers bud from leaflike hoods similar to two-inch heads of wheat.

more about farming bamboo than any other people.

Even such specialists as Mr. Suzuki, however, cannot explain why Japan's most abundant variety of bamboo, the *madake,* is today flowering, or why it is that after bamboo flowers it withers and dies. The blooming of the *madake* began nearly ten years ago, and by mid-1970 more than half the entire stand will have died or been damaged. No one agrees as to when the *madake* last flowered or when it may flower again after it comes back—perhaps in five years. To learn all the secrets of this life cycle would take generations. For the life-span of the *madake* is thought to be as short as 60 years or as long as 120.

The 1,250 species of bamboo vary in height from a few inches to 120 feet. Most send up clumps of tree-like shoots. The genera of Japan and China, however, stand apart in a strikingly stately fashion.

Takeyoshi Suzuki, forestry researcher, inspects a grove of long-jointed *madake* bamboo.

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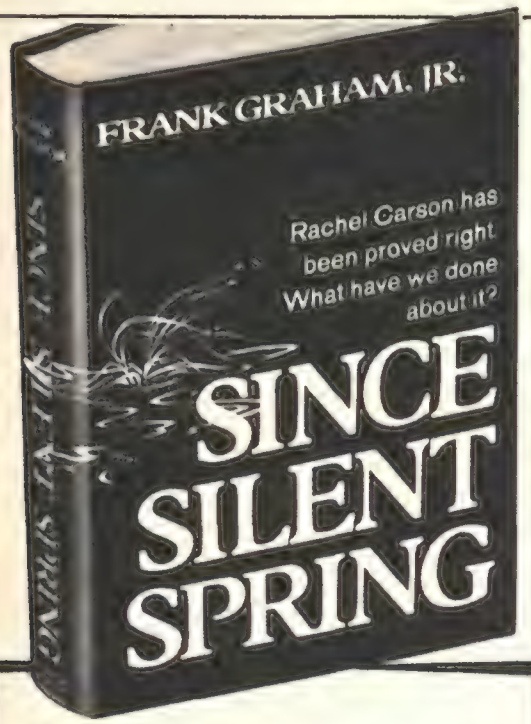

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During my war years in Chungking, a Chinese pointed out how history had failed to record one of man's great ages. "Your books," he said, "speak of the Iron Age, Bronze Age and Steel Age. But in Asia we have the Bamboo Age." And he demonstrated how bamboo was used in China's blockaded wartime capital: for water and sewer pipes, for tools and knives, to replace broken springs in automobiles and trucks, for building materials and even for radio parts and watch springs.

The heart of the bamboo lives beneath the earth, and the hollow, fibrous reeds which show above the ground are only branches. They may grow as much as 16 inches in a day, and in their early sprouting stage have been known to break through the earth and grow a yard or more in a night. When Mr. Suzuki first took me into a grove in the Mukomachi area on the outskirts of Kyōto, I saw bamboo similar in girth and height. Yet some were only six months old and had another five years to go before they would be ready for market, while others were marked to be cut.

"This bamboo," said Mr. Suzuki, putting his arm around it affectionately, "is a baby. It was just born. It looks as big as its brothers here. But it has no strength. It will take five years to gain that. We do not say that a young bamboo like this has not grown yet, because it has already grown all it will ever grow in its first three months. We say that it is not yet ripe." He showed me the distinguishing mark of these babies: a whitish wax coating on the green stalks.

Bamboo shoots are never cut from a grove grown for wood. Wood and food are raised as two distinct crops. In a food grove, the stalks stand relatively far apart and the ground is heavily covered with humus. When such a grove is producing it is watched and cut steadily.

When a bamboo flowers it dies within the year, so the farmer cuts it for market immediately. Yellow bamboo loses value. The farmer also seeks bamboo groves that are not flowering to test and "see if they have the strength," as the Japanese put it, to be transplanted on land where a grove has died.

When I asked if a bamboo farmer

Yellowing canes of *madake* wither beside an evergreen forest.
Having flowered, grove may not be restored for years.

ever turned to other, nonflowering species to transplant into his flowering *madake* grove, Mr. Suzuki was aghast: "The species would fight until one was destroyed."

Bamboo remains one of Japan's major crops, but one of this modern nation's most important industrial products is replacing it: plastics. Cheap plastic products are taking the place of more costly and aesthetic handcrafted articles of bamboo. In the long run it may be an industrial revolution, rather than a natural life cycle, that deprives Japan of many bamboo groves.

But in the meantime the flowering and death of the *madake,* which supplies 80 percent of Japan's industrial bamboo is, according to Dr. F. A. McClure, Smithsonian research associate, a mystery. The unanswered questions, he concludes, "are still a challenge to the experimental plant physiologist."

Carl Mydans, famous Life *photographer is author of* More than Meets the Eye, *and, with his wife Shelley,* Violent Peace.

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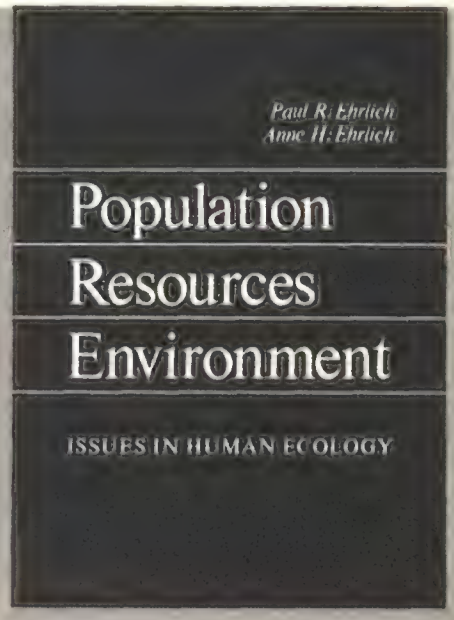

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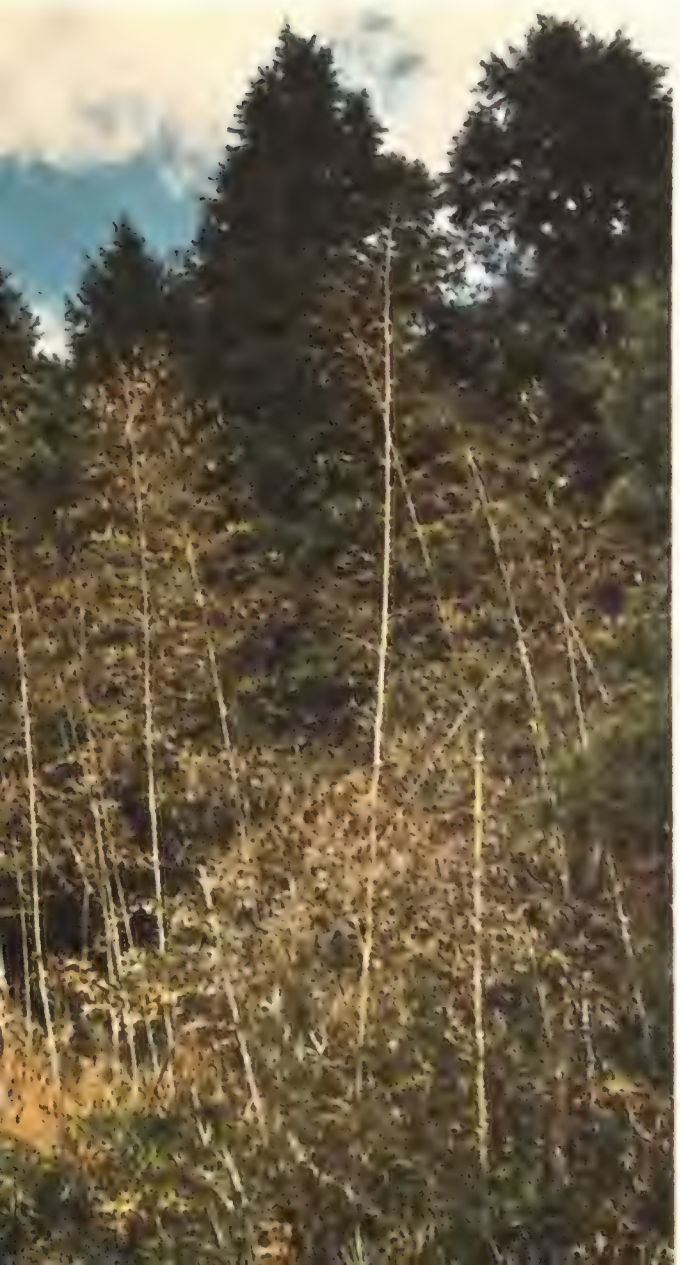

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By Ralph E. Lapp

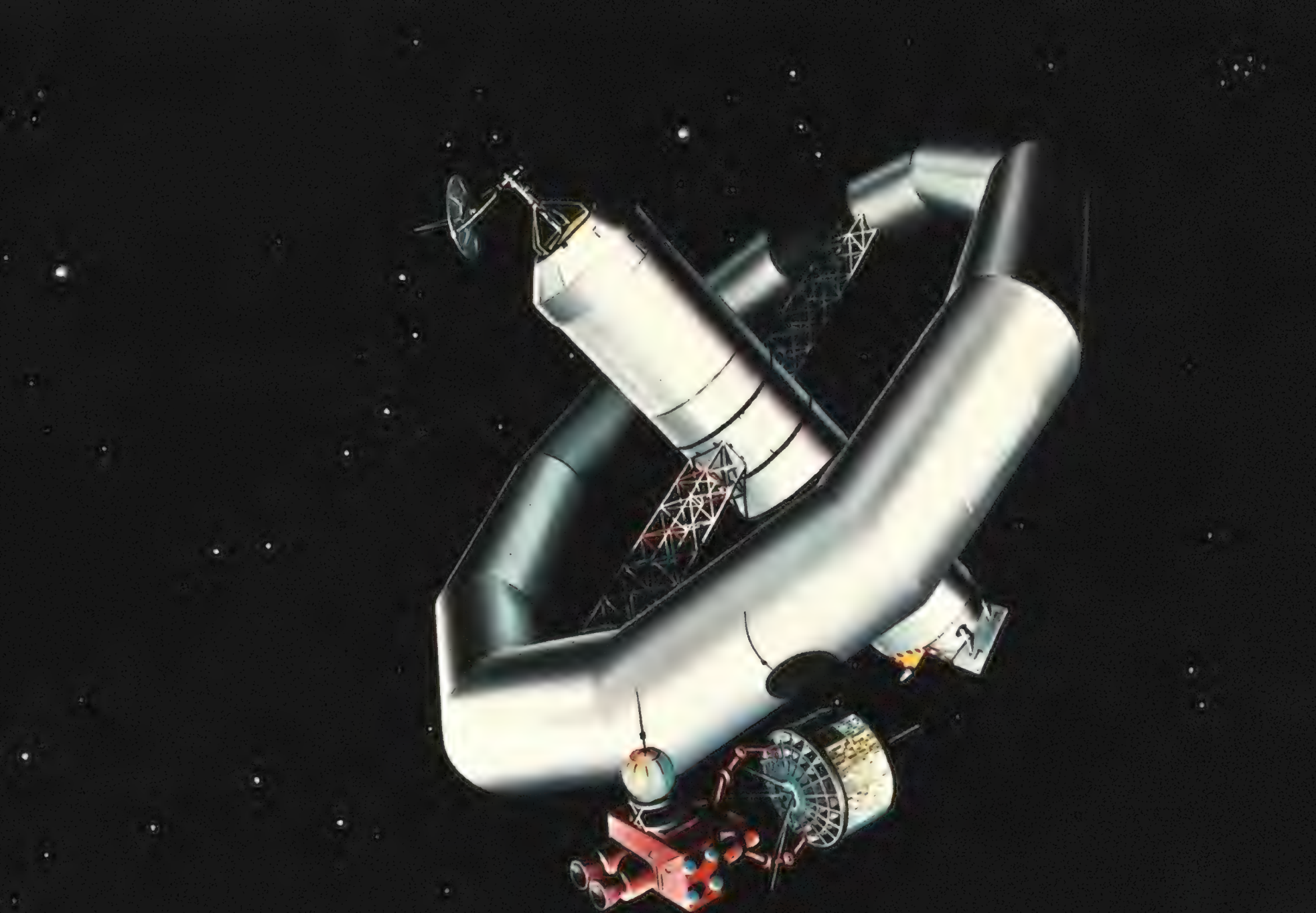
The next big steps for Man in space

In the 1980s inhabitants of lunar colonies and orbiting repair shops may be servicing satellites and exploring the outer planets

The future of space activity during the 1970s has begun to take shape. President Nixon has revealed, in general, the administration's goals for the decade. Emphasis is on unmanned probes for exploration for the time being. The future of manned probes is somewhat uncertain although hopes that a team can be put on Mars in the 1980s persist.

Using an only slightly clouded crystal ball, I can look logically to the future and describe space activities as they might develop in the '80s. Even now the President has given his blessing to a manned space station (above) and the shuttle (page 35). The space tug capable of recovering satellites and bringing them in for repair will wait for a time when more men will be doing more jobs in space.

The Apollo missions provided the thrust and vehicles for quests in orbit and beyond. After their travels,



Future sky has earth in front of Milky Way, constellation Orion (including red giant Betelgeuse) above shuttle, Taurus above station and tug, Pleiades at upper right. Just below earth is brightest star Sirius. Celestial equator (intersection of the plane of the earth's equator with the fixed stars) runs from point below station to one above the earth.

getting out and walking while in flight, landing and coming back with cargo, men of this age are not likely to lay aside the hardware that made it possible. Despite budget squeezes and urgent other business, their curiosity will thrust them on to practical and impractical accomplishments in space. Some purposes of manned flight will be those of pure science, some of which may seem to be impractical. No money value will be apparent when missions take off. Economic justification will depend on man's faith in eventual payoff from expansion of knowledge.

Physicist Ralph E. Lapp is a former assistant director of Argonne National Laboratory, government adviser and author of a dozen books on nuclear radiation, space and weapons. Most recent is Arms Beyond Doubt, *published by Cowles.*

Some activities are already practical: communications, resource surveys, weather prediction and pollution monitoring. In 1970, these jobs probably can be done better by unmanned probes and satellites. But some estimates indicate that, when enough instruments are floating in space, satellites that are repaired and refueled will be cheaper and more efficient than those made with such care and with so many redundant circuits in parallel that users have been able to count on them almost never to fail.

With the present National Aeronautics and Space Administration (NASA) budget reduced to a little more than half of its almost $6 billion peak in 1966, it is easier to say what man's next steps in space will be than when they will occur. They will not be as frequent as were the giant strides of the 1960s. A space timetable would seem to imply deeper manned mis-

The next big steps for Man in space

sions for the future, specifically to the nearest planets, Venus and Mars, although manned landing on Venus is ruled out by the hostile, hot clouds there. For the near future the U.S. manned flight program is keyed to using up its eight or so remaining moon rockets for a stretched-out series of lunar explorations until 1972 and for Apollo Applications Satellites as forerunners of true space stations. NASA's most ambitious new program is the space shuttle to cut costs of transporting payloads in space.

The high cost of hurling objects into space is now dictated by the huge booster rocket required to accelerate payloads to very high velocity. The colossal Saturn Vs cost almost $200 million each with no allowance for previous research and development. It can put a hundred tons of payload into earth orbit, which figures out to a cost of roughly $1,000 per pound. Costs escalate sharply for manned missions requiring round trips and descent-ascent maneuvers with a module, as in Apollo flights to the moon.

The Saturn V that dispatched Apollo 11 on its historic mission to the moon weighs more than six million pounds on the launch pad. Its huge engines and fuel tanks are discarded, stage by stage, and fall back into the ocean or burn up in the atmosphere, never to be used again. Because rocket experts have squeezed about every ounce of thrust possible from existing chemical fuels, the key to economy in future rocketry lies in finding ways to use booster stages over and over.

That's precisely the direction of NASA-industry plans for space shuttles, but these plans are still being defined. With *reusability* as the prime objective, the designers have evolved three basic spacecraft concepts:

► a low-cost expendable booster combined with a fully reusable orbital vehicle. The combination would strongly resemble Saturn V, but the first stage would be solid-fueled and the second would have a low-cost liquid fuel engine

► a partially reusable booster plus a fully reusable orbiter. In this "stage-and-a-half" design, liquid oxygen and hydrogen fuel tanks would be dropped when emptied during flight

► a fully reusable booster and orbiter. This combination would have as a primary stage a manned, winged vehicle that could be flown back to earth and landed at a conventional airport after boosting its orbiter to the required speed. Some versions of this flyback booster have a single delta-wing design, and others embody a concept in which two boosters are hooked onto the orbiter in a side-by-side alignment.

The goal is transport at $20 per pound

The basic flight plan of the space shuttle consists of a vertical launch and a programmed trajectory to an altitude of some 30 miles. At this point the booster and shuttle separate, and the booster flies back to a base perhaps 150 miles away from the separation point. The orbiter continues to accelerate along an upward arc governed by guidance from on-board computers.

A space shuttle is envisioned as capable of transporting into orbit a payload weighing as much as 50,000 pounds and occupying as much as 10,000 cubic feet. Those designed to ferry personnel to space stations could accommodate up to 20 persons—not all specifically trained astronauts but ordinary people in good health. The orbiter would be self-sufficient. Return trips to earth, unlike the ballistic acrobatics of Mercury and Apollo capsules, would ease the pain of reentry with a body designed to produce lift when traveling through an atmosphere at speeds much, much greater than that of sound. Upon slowing down, the winged orbiter would proceed by powered flight to

Floating above the earth a space shuttle disgorges a working satellite ready for communications, survey or observation.

subsonic velocity and an ordinary jet landing on a commercial runway.

Space shuttle development poses multiple technological challenges to conquer the full spectrum of flight from orbital speeds down to subsonic velocity. NASA estimates that some $11 billion will be needed to perfect the new transportation system by the late 1970s. It hopes that spacecraft can be used 100 or more times and that this iteration will reduce shuttle costs dramatically. A $50-per-pound transportation cost from earth to orbit has been fixed as an objective for the 1970s and $20-per-pound for the 1980s.

When such low costs are achieved for the orbiting of a spacecraft approximately the size of a Boeing 727 aircraft, NASA officials report that they will have at hand "the keystone to the success and growth of future space flight developments for the exploration and beneficial uses of near and far space." The report outlines six basic missions that are intended as jobs for the space shuttle to do:

- to provide logistic support for a large space station
- to place satellites in orbit, retrieve them and collect space debris such as booster fragments
- to haul rocket sections and payloads to orbit, preparatory to dispatch on missions to Mars and beyond
- to cart propellant loads to orbiting vehicles for fueling
- to ferry men to orbit for service of satellites
- to make brief orbital missions, as required for, say, a space rescue operation.

These ambitious space missions assume that man has real value in space, justifying shuttle operations that require about seven tons of orbiter weight per person ferried up to a space perch. Inevitably man's worth in space invites, indeed compels, his comparison with the value of unattended instruments. In the decade of the '60s the United States carried out 20 manned orbital space flights, beginning with the trip of John Glenn on February 20, 1962. Manned spacecraft have logged more than 2,000 hours of flight time. A total of about $25 billion has been spent on manned space ventures to date.

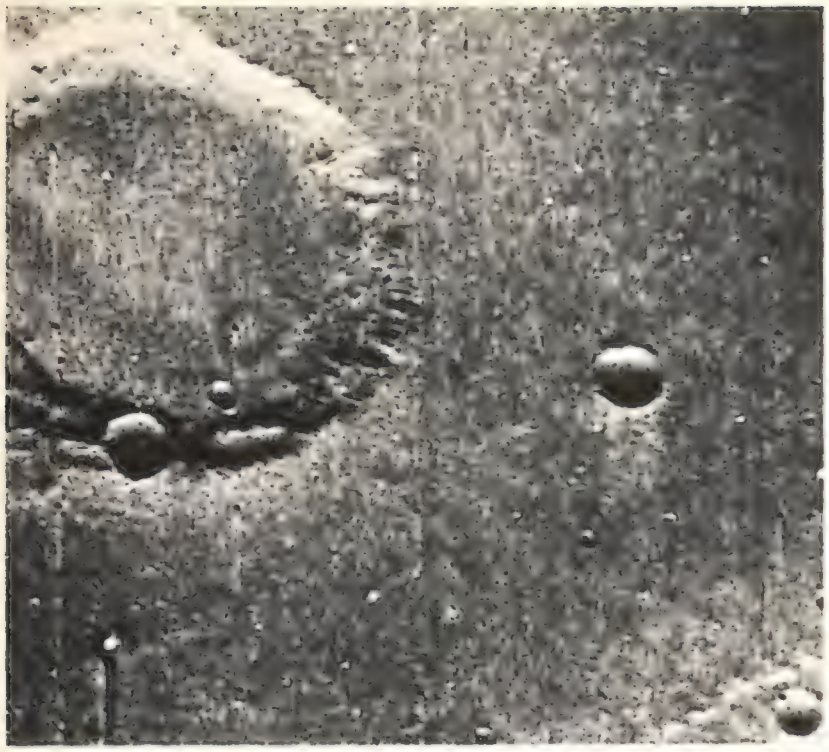
Often instruments will do it better

If we take a coldly clinical look at man as a space creature we can analyze him as a three-pound computer brain linked to a pair of optical sensor eyes, the combination being articulated to manipulate two arms and ten digits. On the moon, man also has two-legged mobility. As an optical sensor, man can be rivaled by television cameras and photographic apparatus having both ultraviolet and infrared perception and permanent registration of images.

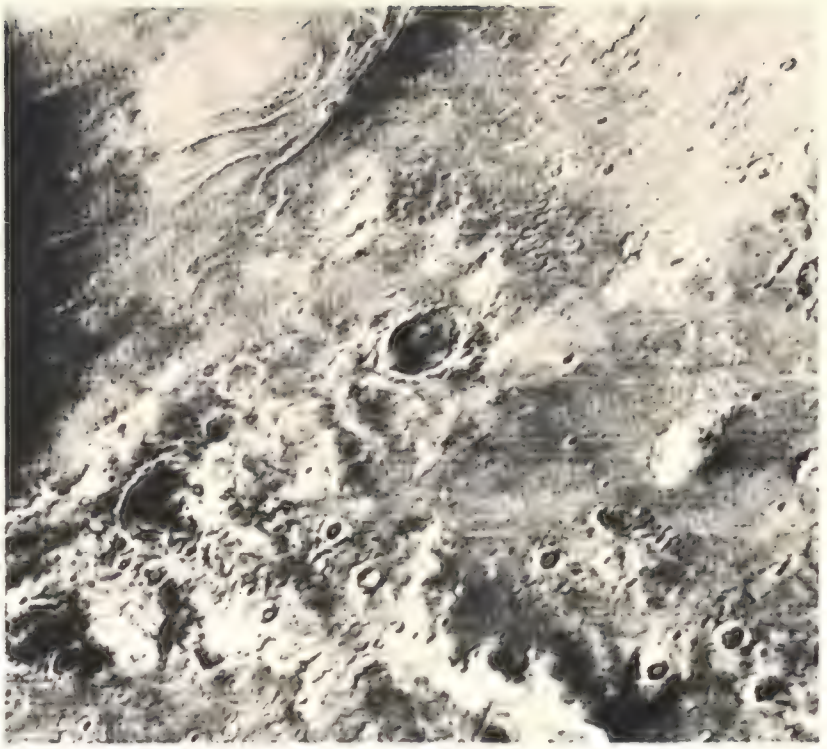
U.S. unmanned satellites routinely photograph territorial strips of the Asian land mass and dispatch film cassettes back to earth. Such military surveillance devices, for instance, keep track of new missile silos. Nonmilitary satellites continuously observe the earth's weather, its cloud cover and temperature, and relay the data to earth stations. Others make geodetic observations and still others act as navigational aids to ships. Various communication satellites orbit the earth to link remote points through many channels of voice and television.

Farther from the parent planet, robot instruments have performed most impressively. For example, five years before men landed on the moon, Ranger 7 transmitted back to earth good pictures of the lunar surface. Surveyor 1, a 600-pound automated spacecraft, soft-landed on the moon and sent back 11,150 revealing photographs of the environment. Surveyor 5, launched in the fall of 1967, did more than emulate man's eyes; it made a chemical analysis of a sample of the lunar crust and transmitted the data back to earth.

The virtuosity of instruments, attained by microminiature electronic components, has warmed the hearts of space scientists whose fundamental motivation has been to acquire new knowledge about the solar system and the universe. In 1968, when a Space Science Board task force of the National Academy of Sciences studied future plans for space, Gordon J. F. MacDonald concluded, "We were unable to identify a need in planetary exploration, in the foreseeable future, for the unique abilities of man." This



Mariner 6 picture, twice enhanced by computer to eliminate accidental signals, shows that instruments do some space jobs as well as man and at lower cost.



Mars south polar cap may be carbon dioxide or water ice. Computer increased contrast to show unusual detail in this view of ridges and craters.

report did little to heal the rift in NASA between scientists bent on seeking new knowledge and astronaut-engineer factions dedicated to pursuing more manned missions.

I stress the man-versus-instruments issue because as long as space dollars are in short supply, expensive new manned missions will be difficult to fund. Thus we can understand why the recently announced space goals for our decade include the so-called "Grand Tour" explorations of the outer planets and an unmanned landing on Mars but put off a manned visit to the red planet as a "major but longer-range goal." One has to make some assumptions, hard to come by, about the state of the federal budget many years from now to fix a timetable for various space activities.

* * *

I make the following optimistic assumptions: In 1976 the United States and the Soviet Union sign a Strategic Arms Limitation Treaty. By 1978 confidence in the treaty builds up, and both nations cut back their defense budgets, releasing funds that in the United States are partly diverted to the space agency. Toward the end of the decade NASA is hard at work on the exploitation of orbital space, the exploration of the moon and plans for sending men to a Martian orbit.

Assuming this resurgence in space activity, we can imagine what we would find if we could turn on the time machine of Jules Verne and beam ourselves into the 1980s. Let us turn, therefore, from the ground-based constraints of uncertain fact and enjoy the flightly freedom of plausible fiction.

In the 1980s, shuttles operate on schedules from spaceports in Florida, Texas and California. For example, the busy Texas cosmodrome on Matagorda Island, 120 miles southwest of Houston, dispatches 20-man earth-to-orbit flights twice weekly. Its work load is heavy because of cargo shipments to Mars-Alpha—the assembly complex in orbit where work crews are putting together the 1,000-ton spacecraft destined to send men to Mars. In an argument that raged for many months several years earlier, scientists won out over engineers and the Mars mission was "optimized" for scientific results. This meant delaying a manned landing in favor of putting a manned interplanetary spacecraft in orbit about Mars so as to control the dispatch of instrumented "landers" to the Martian surface. This compromise in the Mars program allowed total costs to be brought below the $100 billion mark and made the venture feasible.

When fully assembled, the Mars craft, shown in the illustration on page 37, will have the shape of a huge, long-armed T. In the central stem will be a nuclear propulsion unit, and out at the ends of the arms, far from the radioactive fuel, will be two capsules in which the crew will live.

The Matagorda space base is the center of all work on nuclear rocket propulsion, which by the 1980s is the mode of thrusting most spacecraft once they are in orbit or deep space. Because the fuel of such compact nuclear engines becomes highly radioactive when the unit is operated, none of them is used to propel vehicles out from earth. They do many tasks

for space stations, however, in providing them with constant sources of electric power. As propulsion devices, they are used in space tugs both in orbit about the earth and around the moon. Powerful nuclear thrusters propel spacecraft from earth orbit to the moon on once-a-month shuttle flights. Since the nuclear engines are simply sources of intense heat, they have to be harnessed to huge tanks of liquid hydrogen, which is squirted into the engine core and expelled as a hot and incandescent exhaust.

Despite many years of research on esoteric means of propulsion, all spacecraft in the 1980s operate as "Newtonian coasters." A relatively brief thrust accelerates the craft to the required velocity, and thereafter the ship coasts through space, surmounting the earth's gravity hill and then being caught by the pull of the moon's gravitational attraction. Thus the trajectory pioneered by Apollo 8 in 1968 is still followed on the earth-to-moon flights of the 1980s.

The moon is now colonized although the lunar population consists of only 60 men and women. (The Russians were the first to insist on putting women on the moon in the international colony, which was founded as a result of the 1984 International Space Agreement.) The lunar colony consists of three buildings interconnected by a triangular tunnel arrangement. One of the almost totally concealed units is reserved for living quarters and recreation; another is a supply depot, and the third is the major scientific facility, an astronomical observatory.

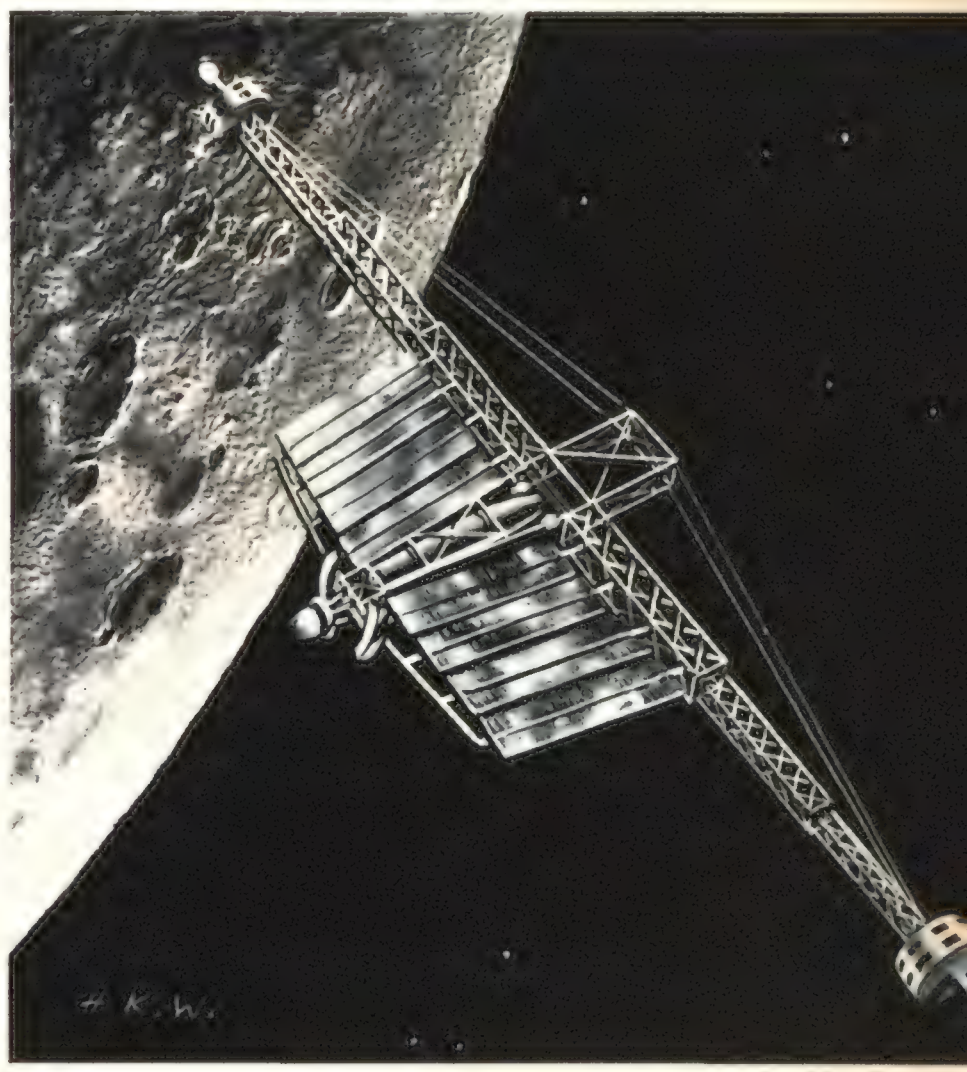
To construct the lunar colony required a total of 20 earth-to-moon cargo shuttles of equipment that was fully assembled in an earth orbit. Each 20-ton piece of the lunar base was deposited gently on the lunar surface by a system of automated controls operating between a manned lunar orbiter and a temporary lunar outpost. A special "moon-digger" operating on nuclear electric power supplied by a powerful reactor at the landing site obediently excavated footings for the lunar buildings and then heaped moon soil over the exposed top surfaces. Pioneer astronauts who first manned the lunar base said that life below the lunar surface was not much different from the training they experienced at Antarctica.

The lunar observatory publishes its own scientific journal both as a computer printout on the moon and as a simultaneous edition on earth, this being accomplished with one of the earth-orbit to moon-orbit communication channels. The large lunar telescope, although a prominent feature of the base, vies with an even larger one that is deployed at a space station circling the earth. Actually the principal scientific activity at the lunar colony is exploration of the lunar crust and geological formations. A lunar drill, cutting its way below the 1,000-foot level, confirmed the scientists' suspicions that the moon, like the earth, has a thin outer crust.

Neither the lunar colony nor the Mars-Alpha venture would have been undertaken had the world's space program not produced a series of real "payoffs" in orbital space during the 1970s. As a general rule, the payoff of space projects diminishes as the spacecraft recede from earth. Close to home, orbital devices, both manned and unmanned, turn out to be extremely useful surveyors of the planetary environment as well as commercially attractive communications systems.

All orbital spacecraft are by this time subject to international registry prior to launch and to constant surveillance by surface radars. The latest orbital inventory of the U.N. space-track facility records 355 satellites, including four manned stations.

At one time a much larger population of smaller gadgets circulated in orbit, but they were "dead" devices, having outlived their usefulness or succumbed to malfunctions. A systematic collection of this space



Mars craft might be long-armed T with nuclear power source in stem, living quarters for the crew, safe from radiation, at ends of bar.

garbage was begun early in the 1980s and apparatus thought to be useful for the future was stored in an orbital depot while the rest was sent back to earth.

Communications satellites again and again have proved to be enormously versatile in handling messages sent out from earth and relayed back again. For example, most large corporations now process business overnight and, using earth-to-orbit communication, dispatch the pertinent data on sales and inventories in digital form so that each plant has on hand the next morning a complete status report on the corporate business.

Public anxiety over dangers of atmospheric and water pollution, first vented before 1970, proved to be fully justified. The control measures adopted in the early '70s, however, proved to be ineffective, and metropolitan air pollution became a recurring crisis late in that decade. Curtailment of automobile traffic in major cities on days of heavy pollution became a frequent annoyance. Pollution monitoring satellites now offer early warning of "bad days," as commuters call them. But mounting atmospheric contamination has led to rigid codes for auto emissions, and high-horsepower cars are things of the past.

Manned space stations, originally accommodating six to 12 men, have been replaced or rebuilt to hold 100 people. Approximately 10,000 individuals have spent some time in orbit. "It's the safest place in the world to be," remarked one veteran orbitman who spent five years in orbit as a station keeper. "There's no pollution, no maddening traffic, and very little chance of accident." His space base was Zeta 6, a ten-section doughnut (as shown in the illustration on pages 32 and 33) enclosing an isolated cylindrical power and supply core.

Fun and games and research in orbit

Zeta 6 is manned by a crew of 15 station keepers who work six-hour shifts, each of which includes four full trips around the earth. Their main job is to watch dials and check the automatic equipment on board and also to attend to waste disposal. Visiting scientists and technicians bear responsibility for preparing meals—a simple task requiring that frozen packages be placed in the radar range.

Two of the ten space station segments are reserved for living quarters and sanitary facilities. Despite the comparative roominess of the quarters, a "hot" bunk mode of sleeping saves space. Six compartments contain bed cubicles known as "silkworm bunks." "Going to bed" means inserting one's body between two plastic sheets and pressing a valve; air fills each inflatable sheet, cushioning the body in a form-fitting double blanket. Bathing is accomplished with a neck-fitting shower cabinet. This sprays the body with a mantle of water, which is then exhausted and recycled.

Another station segment is designed as a gym to keep personnel in shape. The gym is also used for projecting three-dimensional color movies "piped up" from earth. A variety of space games keeps station people from becoming bored by the never-changing environment. Some of the games are curious zero-g versions of earth games. Space billiards, played on an enclosed "table," is very popular. A recently developed electronic three-dimensional pinball machine has become the envy of all game lovers on earth.

The research facilities of the space station are dedicated to fundamental work in understanding the effect of weightlessness on cellular growth. This work has been assigned high priority because of the growing menace of river and lake pollution. Research by a biologist from São Paulo, Brazil, on zero-g changes in *Oscillatoria prolifera* (a brownish filament-forming alga) has focused attention on the role of weightlessness in algal growth patterns.

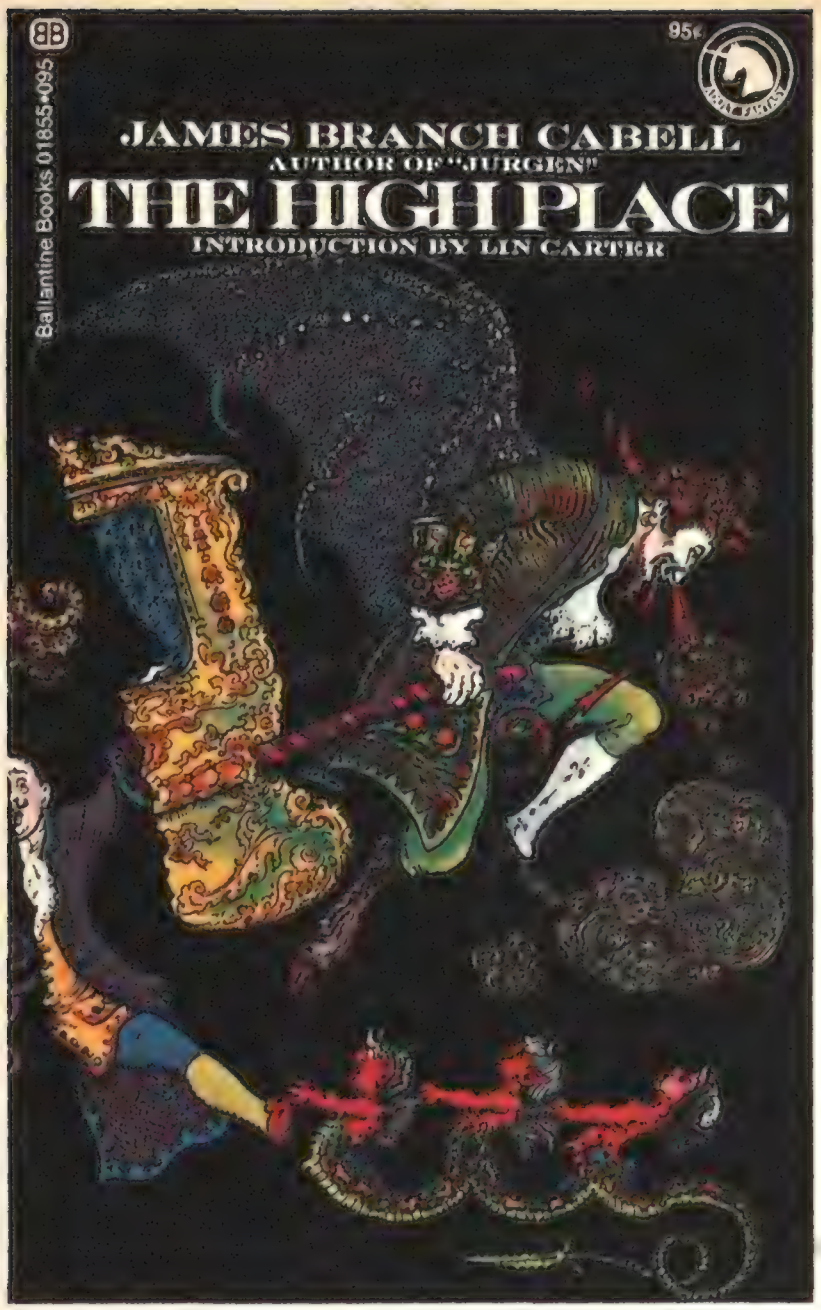
* * *

To return to earth, and back again to an earth calendar dated 1970, these projections of space activity into the indefinite future may prove exaggerated. They are possible, but whether they come true depends on how men manage their affairs on earth—on how warlike they behave and on how much they continue to insult their environment. To maintain a democracy where the expenditure of public funds must be related to the public good, a society must value science not only for its money-earning applications but also for its extension of human knowledge. On such a basis we now look forward to the Grand Tour probes. Current plans will have them on their way to the outer planets in the late '70s, taking advantage of an alignment that will not recur for almost two centuries. They will pass planet after planet, returning data from each one.

Man thrusts himself outward from his planet home and seeks to know the ultimate texture of the exquisitely patterned universe. His intelligence has glimpsed the innermost privacy of the atom, and it has touched the isolation of the outermost stars; it even unravels the subtle architecture of the living cell. The grandeur of the quest, the zest for new knowledge and the beckoning mirage of the unknown excite the scientist. But multitudes of men untutored in the ways of science may fail to sense this cathedral quality unless scientists provide a common understanding of the economic and aesthetic values of research.

The Grand Tour will be the subject of a future article in Smithsonian. *The Smithsonian Institution has been intimately connected with aeronautics and space all during this century.*

Red planet Mars, as seen from Mt. Palomar, is a target for manned landings, perhaps in the 1980s, and also for unmanned orbiters and landers.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AUTHOR OF "JURGEN"
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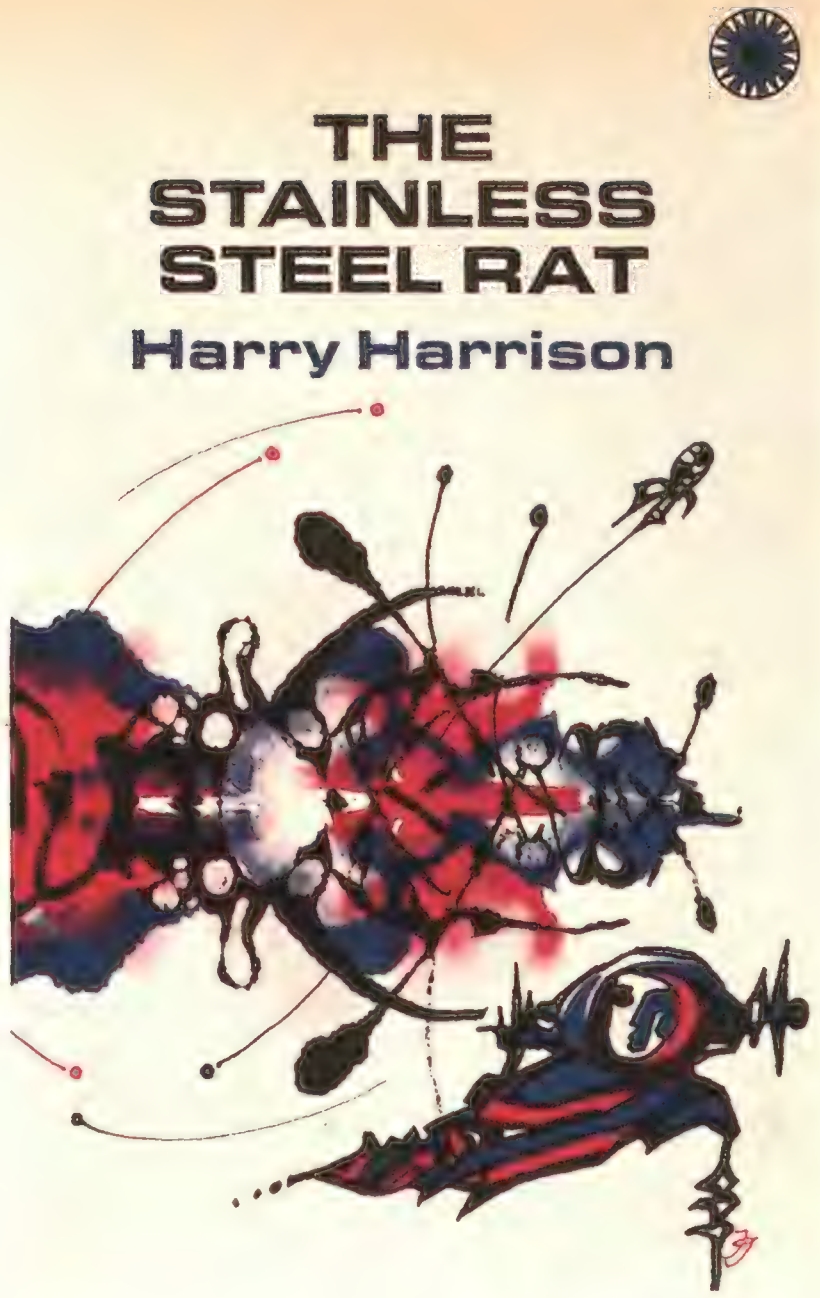
INTRODUCTION BY LIN CARTER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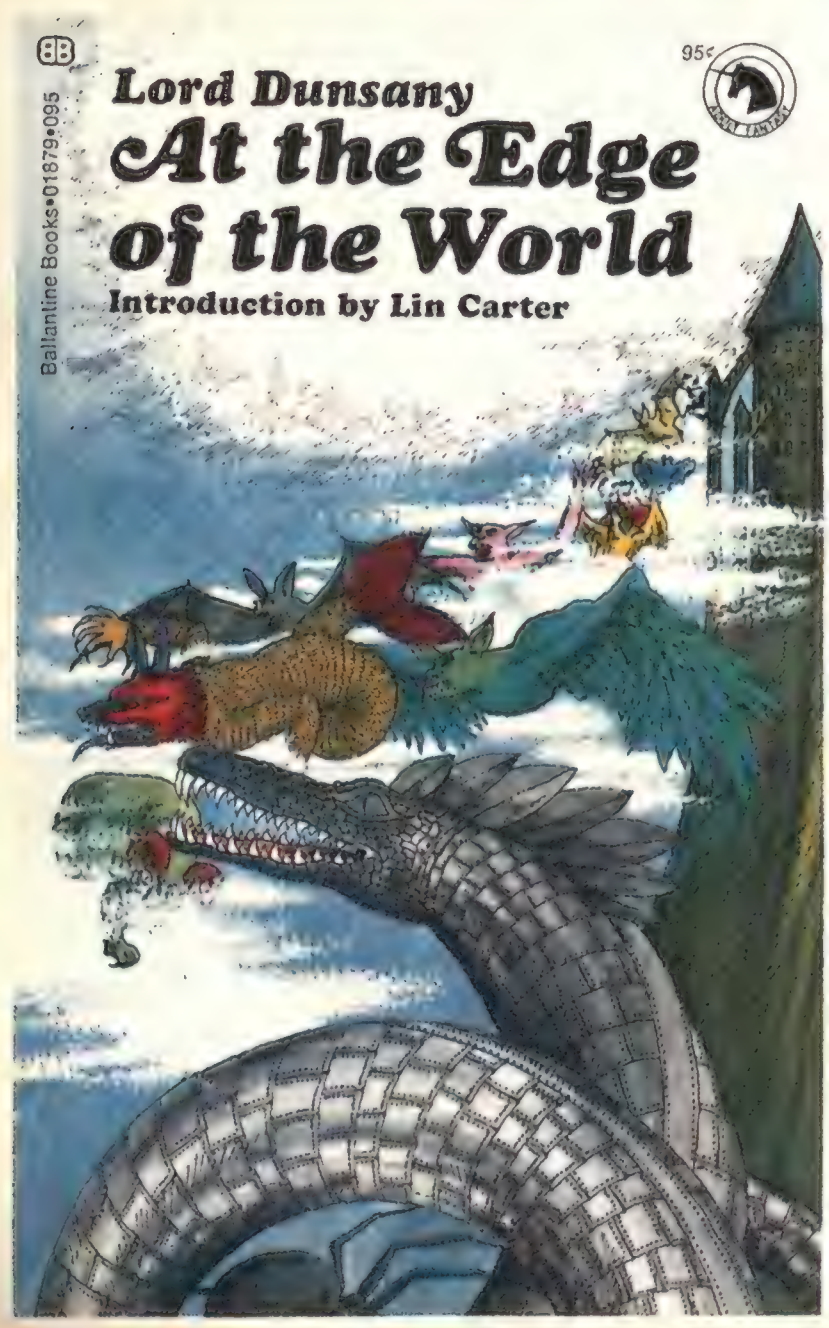
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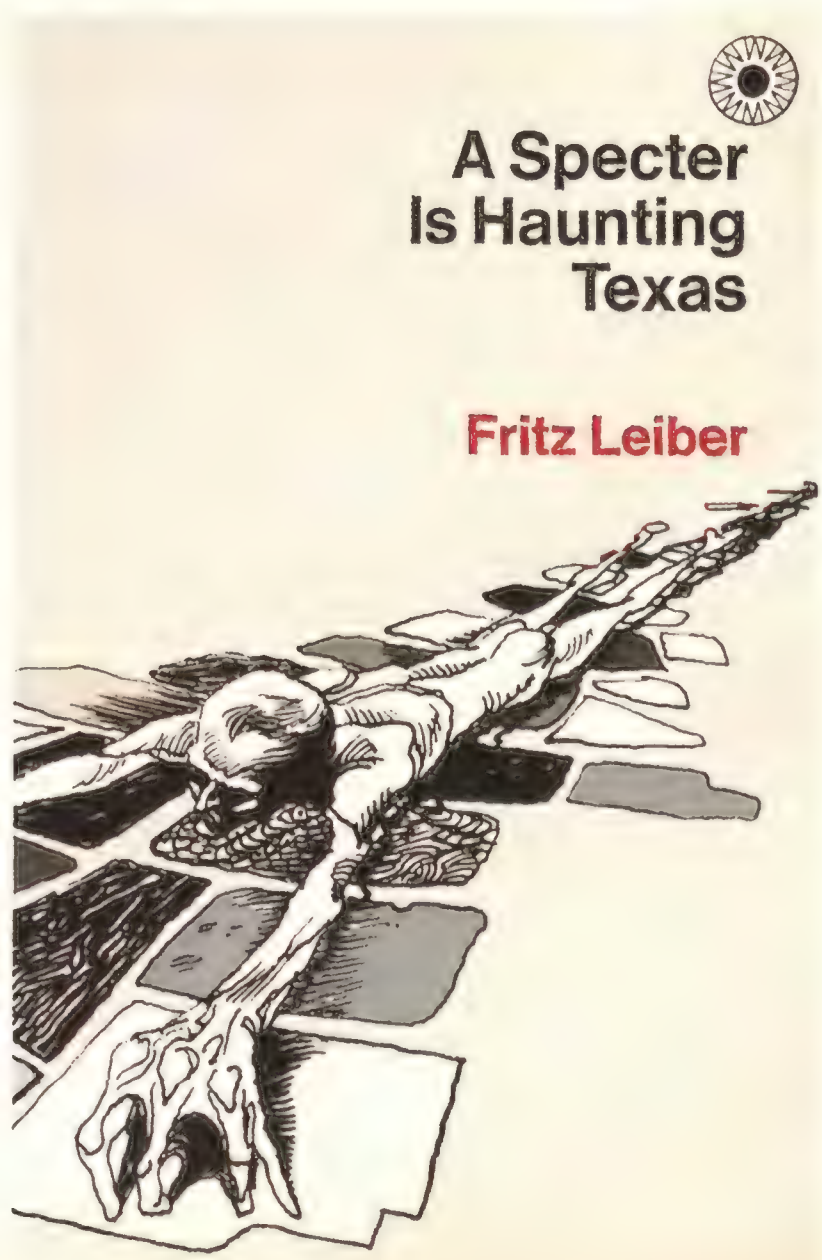
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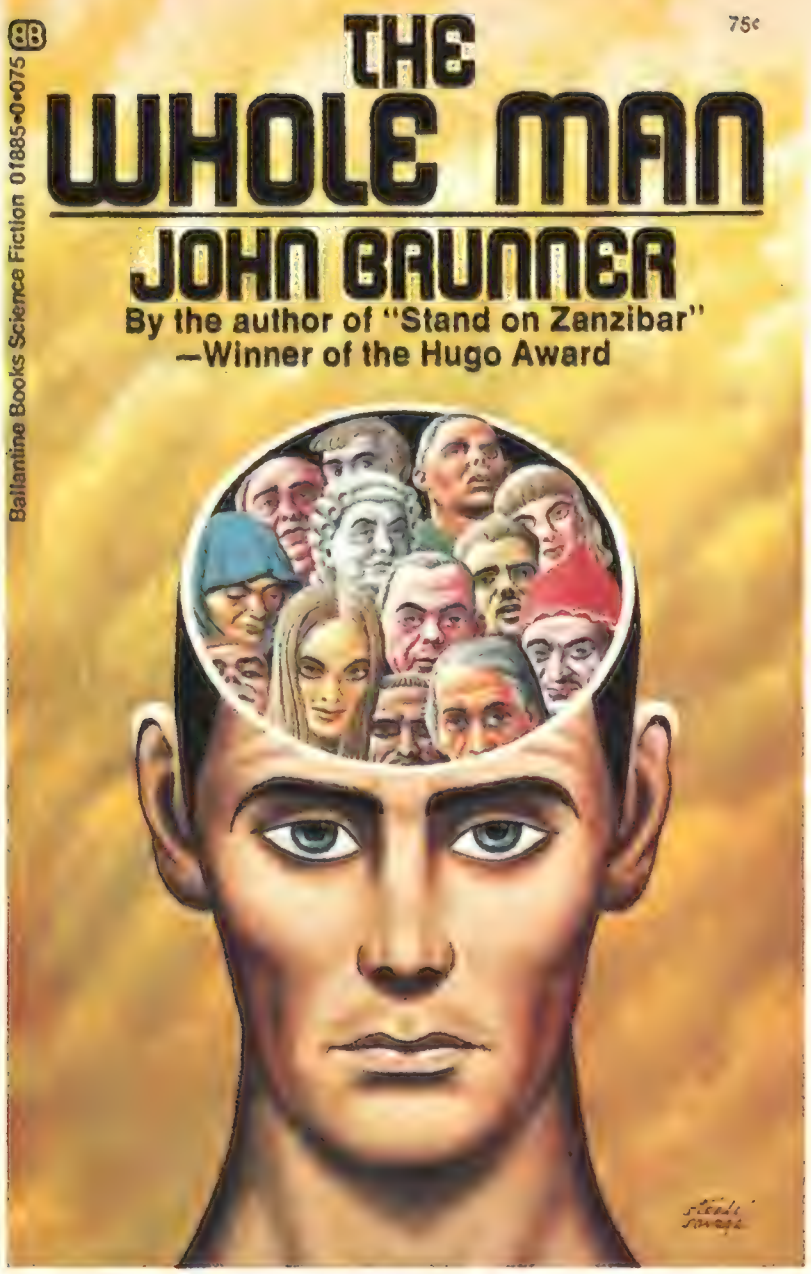
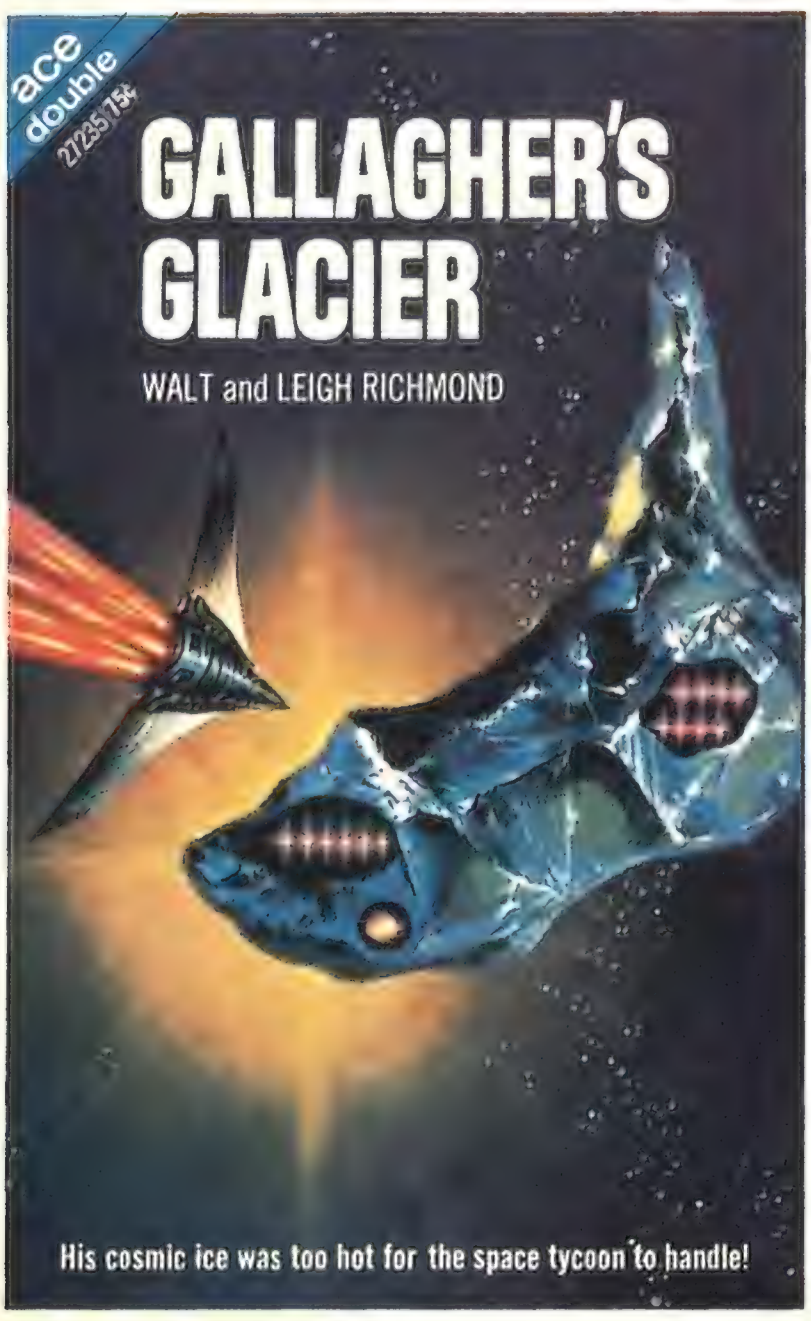
Fritz Leiber





By Isaac Asimov

Science fiction, an aid to science, foresees the future

Yesterday's escape reading has proved to be prophetic since it has anticipated by 40 years many problems of today

When I was a young man, fresh into my teens, I discovered I had a serious disease that earned me a great deal of opprobrium. I was a science-fiction addict and that meant I was an escapist.

This wasn't the only way to escape with trashy reading. There were detective stories, and western stories, and horror stories, and spy stories, and war stories and even (for those strange creatures called girls) love stories. But of all the varieties of cheap fiction, the "escapiest" of all, and therefore the most to be condemned by all of the hardheaded realists, was science fiction.

Where science fiction was concerned one escaped, in a pretty literal sense, right out of this world. Other pulp fiction trash dealt with subjects that were at least partly connected with reality. The Shadow dealt with crime, for instance, while G-8 and his Battle Aces were involved in World War I.

But Mars? And death rays? Come *on*.

So I huddled close to other teen-agers like myself and felt trapped in an alien and unsympathetic world.

Now I am no longer a teen-ager, and when I look

The author, a full-time science writer, was born in Russia and grew up in New York, where he received his Ph.D. in chemistry from Columbia University. He is on the Boston University faculty and has written 103 books of science fact and fiction—so far.

Buck Rogers with ray gun in the 25th century

back over the time lapse of a generation I can only laugh—with maybe a trace of bitterness.

Would you like to know how we escaped? Well, when all the non-science-fiction-reading youngsters were facing the hard realities of baseball and the first cigarette and all the adults were grimly betting on the horses and yelling at each other, we were reading stories about rocket trips to the moon, about space stations and overpopulation, about guided missiles and computers, about nuclear bombs and ruined planets.

Our "escape" consisted of having to worry about the problems and conditions of 1970 ever since 1930. You can call that escape if you want, but, personally, I feel terribly cheated.

Our world is now future-oriented, you see, in the sense that the rate of change has become so rapid that we can no longer wait until a problem is upon us to work out the solution. If we do, there is no real solution. The change must be anticipated *before* it happens.

The trouble is that though the world is future-oriented, people aren't. For uncounted generations change has been so slow in the things that really counted that preparation in advance was not necessary. A whole library of aphorisms can be quoted *against* future-orientation:

"Do not count your chickens before they are hatched."

"Don't cross the bridge till you come to it."

"Never trouble trouble till trouble troubles you."

And of course most prestigious of all is, "Take therefore no thought for the morrow: for the morrow shall take thought for the things of itself. Sufficient unto the day is the evil thereof." That is from the Sermon on the Mount (Matthew 6:34).

So because we, as a species, have never taken thought for the morrow, we find ourselves in this Year of the Lord 1970 with a population we *do* not support, which is increasing with explosive force to a population we *cannot* support. We find ourselves with nuclear war hanging forever over our head and with the more insidious death by pollution closing in upon us.

We are, in short, in the middle of a deepening nightmare. Because we have so long thought that sufficient unto the day is the evil thereof, the evil of *this* day *now* is more than we can bear.

There have always been individuals, of course, who have looked into the future with varying degrees of dread and hope and have tried to warn their fellowmen. Their efforts usually failed, and both legend and history are littered with the tales of prophets whose reward was mocking laughter—from Noah and Cassandra right down to Winston Churchill.

As far as I know, though, there has never been, in all history until today, the concept of professional futurism as a way of life. And this concept arose first not among professional scientists or economists or historians (except for occasional individuals) but in literature. The 20th century saw the development of a

Flash Gordon as an interplanetary traveler

flourishing subsection of literature devoted entirely to conjuring up visions of the future.

It was the world's misfortune that it did not take the ideas of science fiction seriously. So strong was the nonseriousness that even science-fiction writers themselves dared not be too serious about what they were saying.

Back in the July 1939 issue of *Astounding Science Fiction* I published a story called "Trends" that dealt with the first flight around the moon and back, an event I placed in 1973. I didn't *really* believe it would happen by then—let alone five years earlier.

Yet even though science fiction was not taken seriously by the general public, or very seriously by most of its readers and writers, it had its effect. Trips to the moon and beyond were the chief staple of science fiction all through the 1920s and afterward, and this attention to the subject was important. We accomplished something with all our talk of space ships.

We were laughed at, of course, by all the serious nonescapist practical men of the world, but the notion penetrated. Buck Rogers and Flash Gordon, plus assorted lesser comic strips, presented the notion to the very young. Cheap movies presented it to those who couldn't or didn't read. The very sneers evoked by the suggestion of space travel was an announcement that the suggestion existed.

Thus when the notion of flights to the moon was brought before the public seriously, it turned out to be something that people had heard of. It had been laughed at, yes, but it had been heard of. And something ridiculous, but familiar, is far more easily accepted than something utterly unheard of.

The proof of the acceptance is dramatic; for not only is there an appreciation that we have walked on the moon but also a readiness to consider the matter still further.

Once I wrote of colonies on the moon, and the only place I could have such outlandish nonsense published was in science-fiction magazines. Now I write of colonies on the moon in very much the same way—and the articles I write are published by *The New York Times*.

My science-fiction comrades and I haven't changed, but the rest of the world has, and we have helped to bring about that change.

It's a pity we couldn't do it faster and better, but, alas for the inertia of humanity, it takes the lever of Archimedes to move mankind.

H. G. Wells wrote of atomic weapons in 1903, and the theme was picked up and repeated over and over again with increasing emphasis. The atomic bomb was another of those "ridiculous fantasies" we kept harping on.

After the discovery of nuclear fission a very few very brilliant physicists saw its possibilities; so did a great many very ordinary science-fiction writers. This is not surprising. Only the most self-confident physicists dared risk their reputations by extrapolating into the field of the so-called "ridiculous," but extrapolating

in that fashion was the everyday business of the science-fiction writer.

So while the United States was carrying on research into the atomic bomb in deathlike secrecy, the science-fiction magazines were filled with atomic bomb stories that came closer and closer to the truth as the writers sharpened their wits on each other. Finally, in 1944, the magazine *Astounding Science Fiction* published the story "Deadline" by Cleve Cartmill, which described the atomic bomb with such accuracy that it seemed certain there had been a breach of security.

Agents descended on the offices of John W. Campbell, editor of the magazine, and he was able to convince them that the story was based on extrapolation from the known. He was further able to convince them that, if he suddenly stopped printing atomic bomb stories, at least 50,000 science-fiction fans the country over would at once be able to deduce exactly why, and security *would* be breached.

So for the rest of 1944 and the first of 1945 science-fiction writers were free to discuss, in public, something that no one else in the United States, up to and including the President himself, could. You see, the government could count on nobody believing us.

Foreseeing nuclear stalemate and cold war

The prediction of the atomic bomb itself was simple, however. A much more astonishing prediction was made in the story "Solution Unsatisfactory" by Robert A. Heinlein. This story appeared in the May 1941 issue of *Astounding Science Fiction* well *before* the Manhattan Project had been started. It dealt with the establishment of something very like the Manhattan Project, with the development of atomic weapons, with their use to end World War II and *with the nuclear stalemate with the Soviet Union that followed.*

I don't think anybody in the world, even those few scientists who foresaw the atomic bomb, gave any thought to what would follow its invention. The first to do so, and to do so *accurately,* was a science-fiction writer.

What about robots? I myself have written a whole series of well-spoken-of stories about robots, which (I think) have done their bit toward making it just a little easier for the world to accept robots when they come.

What about overpopulation? There have been science-fiction stories dealing with an overpopulated world at a time when leaders of foreign governments were idiotically giving medals to mothers with a dozen children on the theory that a large population made a nation militarily strong and that attaining a population plateau was "race suicide."

Frederik Pohl and Cyril Kornbluth published "Gravy Planet" as a three-part serial in the June, July and August 1952 issues of *Galaxy Science Fiction.* It later appeared in hard covers as *The Space Merchants* and gave a nightmarishly realistic picture of an overcrowded world a decade and a half before scientists began to pound away at the notion. In the February 1956 issue of *The Magazine of Fantasy and Science Fiction,* Pohl went on to even greater bitterness and despair in his story "The Census Takers," which described their chief function in the future—killing, at random, one person out of every so many all over the world to keep the population down.

All of the plagues that threaten us with doom today —from the arsenals of horror bombs and nightmare germs to the pollution that is poisoning our air and water, from stripping of the earth's resources to the loss of human dignity, from the tensions of packing crowds to the lunacies of human prejudice—all, all, all have been treated at length over and over from every

aspect in science fiction when all other varieties of fiction dealt with trivia only, by comparison.

And we are escapists?

But that part of our job is done. We didn't do it well enough. We didn't do it quickly enough. In fact, sometimes we were dead wrong. I won't point the finger at my fellow writers, but in the spring of 1953 I wrote a short story that explained why Mount Everest would never be climbed (the abominable snowmen were Martians). It was published in the fall of 1953, about four months *after* Everest was scaled successfully.

Still, even if such bloopers are discounted, we couldn't do enough. The task was too great; the human population was too numerous, too set in its ways, too determined on its folly, too stubbornly intent on avoiding the uncomfortable, too obstinate in finding sufficient unto the day the evil thereof.

The meeting of the American Association for the Advancement of Science, held in Boston on December 26 to 31, 1969, had as its theme, which was iterated over and over and over, the need for science to face the gathering doom of the future. I was at the meeting and on several of the panels, and repeatedly we agonized over the population problem, over the coming starvation, over the collecting poisons, over the pending bombs.

Good heavens! I never heard anything sound so much like a gathering of science-fiction fans in the 1930s.

What science and fiction can do to help

Very well, men of science, take over. We have roused *you* at least; now see whether you can rouse the rest of the world before the first tolling strokes of the midnight of disaster wake them to the unmistakable horror.

And what can science fiction do to help in this effort now that we are respectable and that we are recognized as the harbingers of change? Are there any concrete and specific ways we can help bring about that necessary change?

There are, indeed, in my opinion, several ways in which science fiction can contribute—on the assumption that what is basically needed is more intelligent science and more foresighted scientists.

I consider that assumption an inevitably correct one. To be sure, the misuse of science and the unseeing enthusiasm of scientists have helped to bring us to our present plight. Undoubtedly but for the advances in medical science, from antitoxins to insecticides, from anaesthesia to antibiotics, the death rate would be as high as it ever was, and population would be that much less a problem. Undoubtedly but for the mechanization of agriculture, industry and transportation, we would still have our famines to cull the population further; moreover oil and coal would stay in the ground so that the pollution from their burning would not be here.

But do we really want to go back? The price of going back is the death of nine-tenths of ourselves and the loss of ten-tenths of our technology. Anyone for the Stone Age?

To cure our ills, while keeping what we have, requires more science and more intelligent science. You may wish that a wave of the wand would restore Earth to some never-never pastoral paradise, but wishing will not make it so—despite Walt Disney. You will have to try science.

And to make more and better science we need more and better scientists; for science is a creation of scientists and has no independent existence.

How do we go about recruiting scientists? How can we persuade youngsters to take up those scientific pursuits that will solve our problems? A science education isn't easy, and neither is a scientific career. To those who are born enthusiasts this doesn't matter but, unfortunately, there aren't enough born enthusiasts to supply us with all the scientists we are going to need. We must tap the much larger supply of youngsters who, *properly stimulated,* will become enthusiastic scientists but who, without proper stimulation, will become, perhaps, advertising copywriters instead.

Isn't science fiction a natural stimulant? I have never counted the letters I have received from young readers who have told me that as a result of reading my science fiction they plan to become scientists someday—but they have been many. I am sure that all other science-fiction writers of note have received a similar set of letters. I am also sure that for every youngster who begins to yearn for science as he reads science fiction and writes a letter to say so, there are ten who yearn but don't write.

It works the other way around too. I have estimated that only one American in 400 has ever read any of my science fiction, but in the scientific circles I frequent at least half have. It appears then that the habit of science-fiction reading is perhaps 200 times as common among scientists as among the general public. It is unavoidable that a number of these scientists may have been encouraged to enter the field through their reading. (Actually I know specific cases in which this pattern has been followed, but the gentlemen involved may not care to have the fact publicized; so I will content myself with one safe example—science fiction stimulated *me* to enter science.)

Aside from a generalized stimulation, science fiction can serve as a definite educational device. Good science fiction generally has some scientific theme that

can be handled with great rigor or with varying degrees of elasticity. Ideally the theme should be handled rigorously, but even the violation of a natural law in a science-fiction story can be useful—if it is handled by a writer who knows science.

Consider, for instance, the second law of thermodynamics. It insists on the inevitable and inexorable increase in disorder with time. Everything *must* run down. While the total amount of energy in the universe remains always the same, less and less of it can be made use of. In the end no usable energy will be left; everything will be reduced to ultimate rock-bottom changelessness. Only random atomic motion will be left—the so-called "heat death."

This pessimistic law is a hard one to grasp in all its aspects, and even scientists stumble over it. Yet so fundamental is it that C. P. Snow has stated that an understanding of the second law is to science what an understanding of the plays of Shakespeare is to the humanities.

In that case ought we not teach second law in junior high school at the same time that we begin to acquaint a youngster with Shakespeare? And how can we do that?

To teach a natural law, show a violation

One way might be to get him to read a story by Walter S. Tevis, "The Big Bounce," which appeared in the February 1958 issue of *Galaxy Science Fiction*. It dealt with an object so elastic that when it bounced, it rose higher than the height from which it had fallen. Then it would fall from the new higher height and would bounce still higher and so on and so on.

Naturally it was necessary to keep it from bouncing at all; for even an initial quiver might lead to disastrous results. It did; the bouncing object got away from its constraint and began to bounce. Eventually it was bouncing a mile high and was striking the ground with bullet-like force.

But the energy of the bounce had to come from somewhere, and it came from the internal heat of the material. As it bounced, the temperature of the object dropped until it froze hard enough to become brittle. At a final collision with the earth, it broke into a million pieces.

Very well. The fact that the energy of motion of the bouncing ball was derived from its heat content is in agreement with the law of conservation of energy, the first law of thermodynamics. Nevertheless the conversion of heat into motion in the manner described violates the second law.

A junior high school student in general science set to reading this story couldn't help wondering whether a rubber ball might not possibly be so constructed as to bounce higher and higher. If not, why not? The story is just the sort of thing that will make the student *want* to know about the second law, and no amount of external pounding can duplicate the effect of a stimulated internal yearning.

Properly used science fiction is an educational resource that is just beginning to be tapped in our school systems. If teachers will rid themselves of the notion that science fiction is nothing more than "escape literature," the tapping can be made more efficient to the benefit of all.

But science fiction can serve other than just youngsters. Not only students ought to know about science these days. Every intelligent, concerned layman ought to take science seriously.

After all, the dangers that face the world, every one of them, can be traced back to science. The salvations that may preserve the world, every one of them, will be traced back to science. The nonscientists, then, must

look to science for either destruction or safety and, if we save ourselves, the nonscientist will pay the tremendous costs of the science that prevents holocaust. He has every right, every *duty* to understand as much about science as possible, to know for what goals his money is spent and to see how effectively it is spent.

Thus we have to bridge this gap between scientist and layman that C. P. Snow has taught us to refer to with his phrase, "The Two Cultures." Then, too, consider the scientist himself. Unfortunately science has grown so large and so all-embracing that it is absolutely impossible for any one scientist to grasp it all in sufficient depth to lead the way to further advances in every direction. He is doing well if he knows enough about one ultranarrow segment of science to do constructive research in it alone; and even then, so intense must be his concentration in that field that he may well end by knowing little of any other.

This can hamper research; for it often happens that advances in one field can be encouraged in unexpected and useful directions by knowledge of other fields that are seemingly unrelated.

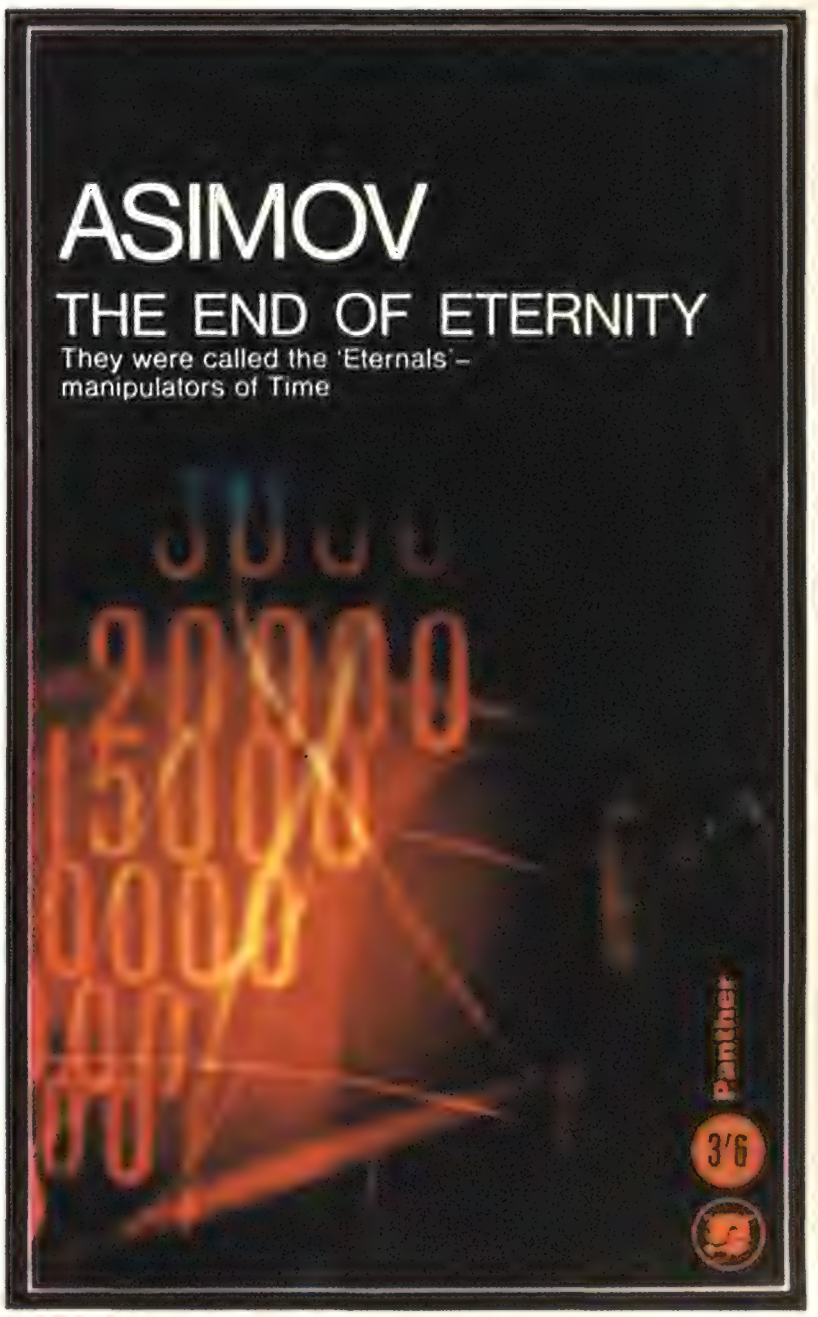
Both scientists and laymen need to learn about science under present-day conditions. I don't suggest science fiction for the purpose (though they are welcome to read it), because I hope that concerned adults, whether in science or not, will not need the sugar coating of fiction. Whether they read science fiction or not they should welcome, in addition, the greater information density of straightforward science exposition.

Writing to train and recruit scientists

But who is to write the exposition? Most scientists do not have a talent for clear and easy writing. Most journalists have not been brought up in science—although a music critic ordered to bone up on science may turn into a first-rate science writer.

May I point out, then, that science fiction is the only field in which the practitioners have to meet the essential requirements of science writing: an understanding of the subject matter and the ability to explain its subtleties with clarity. Many science-fiction writers have switched, under the stresses of contemporary facts of life, to straight science writing and done well (my none-too-humble self for example).

I hope, then, that science fiction will continue to be a recruiting ground for science writers, and for scientists, too, and even for scientific concepts for which the rest of the world is not quite ready. Then, someday in the future, when the world looks back on its narrow escape (I earnestly trust) from doom, some of the credit may fall on that ridiculous escapist field of literature—science fiction.



By Donald Gould

Peter Scott: a master of many trades

Son of one of Britain's greatest heroes, he defies this age of specialization by earning honors in a dozen varied fields

In his studio, Scott indulges one of numerous talents. He has illustrated many books including *A Coloured Key to the Wildfowl of the World.*

Peter Markham Scott, Commander of the Order of the British Empire, twice winner of the Distinguished Service Cross for naval derring-do, thrice holder of the premier British sailing trophy for small boats, Olympic medalist, sometime National Gliding Champion, explorer, familiar guru of British television, painter, author of a dozen books, ornithologist extraordinary, twice Doctor of Laws *honoris causa,* counselor to the Establishment and friend of kings, says of himself in this, his 61st year: "I just don't seem quite to make the grade—I mean, occasionally I win a gliding championship, but when it comes to the things that matter in life, I think I'm sadly not quite good enough."

Coming from someone so plainly successful as Peter Scott, talk of this sort is in danger of being dismissed as an affectation, but a closer look at the career of this remarkable man, whose entry in *Who's Who* occupies nearly eight column inches (roughly twice the space devoted to either the Prime Minister or the Archbishop of Canterbury) strongly suggests that he has indeed spent his life vainly attempting to live up to the image of a superman.

How did this gentle, shortish, slightly pudgy fellow with dreamy eyes acquire the divine discontent which has driven him from one achievement to another? There is one obvious answer. His father was Captain Robert Falcon Scott, known simply to his countrymen as Scott of the Antarctic. In January 1912 Captain Scott with four companions reached the South Pole and was bitterly disappointed to find that the Norwegian, Amundsen, had beaten them by a month. On the long haul back to their base the British explorers perished after a brave but futile struggle against cold and hunger. The circumstances of their death at that heyday of empire made them instant national heroes. Their leader in particular became the supreme symbol of the British ideal.

At this time Peter was two years old. He grew up the son of a father he had never known, but whose illustrious life and death he was never allowed to forget. He recalls hearing total strangers pointing him out in the street and saying, "That's Captain Scott's little boy," and he remembers his mother reading to him from his father's diaries before he had learned to read himself. Inevitably he came to feel himself in some way set apart from the children of common-

Donald Gould's capabilities are almost as broad as Scott's. A qualified M.D., he took to journalism, was recently editor of New Scientist, *still writes for it as well as other prestigious British journals and occasionally does a book review* *(see page 62).*

place, living fathers, made of familiar flesh and blood.

There was, too, a second important influence shaping his life. A few days before his death in Antarctica, Captain Scott had written to his wife about his small son: "Make the boy interested in Natural History. It is better than games. They encourage it at some schools. . . ." Eight months later the explorer's tent was found, and with it the letter. The request it contained had all the authority of a dying wish. Peter recalls that his mother carried out the order with a light hand, never forcing the pace. Yet she evidently meant to see her husband's will fulfilled, for she recruited powerful allies, among them young Julian Huxley and Sir Ray Lankester of the Natural History Museum, both of whom showed the boy the fascination to be found in living things.

As a child Peter became familiar with the great of the land. He once seized hold of Queen Alexandra's bustle and exhorted her to join him in a game of trains. There was no doubt where he belonged in the social scale. At school he took life fairly easily, not yet troubled by a need to outshine his companions. He preferred fishing and caterpillar hunting to organized games. He did find he could swim faster than the others but this was a happy accident and not, like his later accomplishments, a hard-won skill.

Only when he became an undergraduate at Cambridge did he begin to be plagued by the fear that his undistinguished record at work and play was less than people expected from a hero's son. Of this time he says, "I was all set for a terrible inferiority complex, and I felt I'd somehow got to beat this one, and be competitive, and do things that I could do, and start to win."

Sailing provided the opportunity. He joined the Cambridge sailing team and trained himself up to championship standards with the energy and single-mindedness that were to characterize all he did from then on. "The blue ribbon of small boat sailing was a thing called the Prince of Wales' Cup," he explains, "and so I had to win the Prince of Wales' Cup, and in due course finally did so. Three times, actually."

He also represented Britain in single-handed sailing at the Olympic Games and carried home a bronze medal. Much later, in 1964, he was helmsman of *Sovereign* when she was disastrously beaten by *Constellation* in her challenge for the *America*'s Cup. He describes the incident in the newer edition of his autobiography in a very short chapter. Its title: "A terrible failure."

His early dedication to sailing was matched by a growing passion for wildfowl—not as a naturalist, but as a hunter. He devoted enormous physical effort and mental cunning to the business of outwitting and killing the ducks and geese which abounded in such rich variety on the marshlands and estuaries north and east of Cambridge.

On leaving the university, Scott settled down to learn the business of a painter, first for a year at Munich, then for two years at the Royal Academy

Schools in London. Since then he has turned out numerous competent portraits and drawings and almost uncountable studies of wildfowl. His canvases are in no sense great art, but they are popular. During World War II, no wardroom of a Royal Navy ship was complete without a selection of Peter Scott ducks winging endlessly across a bulkhead. Now he still tries to paint or draw at least a little every day. He completes some 20 canvases a year, which sell (according to size) for between $1,500 and $4,000.

Shooting, painting, writing and sailing filled most of his time in the '30s. Then came war and with it a fresh opportunity "to do the things I could do—and to win." Scott served first on a destroyer in the Battle of the Atlantic and later as a skipper in the hit-and-run gunboats of Light Coastal Forces, with all the chances such service gave for initiative and daring.

He enjoyed that war. It was a long, dangerous, fast-moving game of chess against a well-matched enemy. Skill and intelligence counted for as much as courage. Sheer impudence often paid dividends. Night after night through the war years Scott led his small craft in harassing attacks on the German-held French coast and coastal waters. He took innumerable calculated risks and faced as many uncalculated crises, but amazingly, as often seems to happen with such men, some power saved him from serious hurt. He was three times mentioned in dispatches, made a Member of the Order of the British Empire and awarded the Distinguished Service Cross and Bar.

Immediately after the war there was a brief excursion into politics. He stood as a Conservative candidate for Parliament in the 1945 election and narrowly lost. He is glad, because the experience persuaded him that the successful politician needs a penchant for hypocrisy which he hopes he lacks.

A far happier undertaking soon followed: formation of the Wildfowl Trust. This marked the final stage in Scott's conversion. He had become increasingly unhappy killing birds. In 1945 he took part in a goose shoot at Slimbridge on the land bordering the River Severn in Gloucestershire. He and fellow hunters blasted at a lone goose which fell wounded, out of reach on the soft estuary mud. For two days and nights it stayed there, unable to move, head up. Finally the gulls killed it. Peter Scott, who was already sick at heart with blood sports after five years in which he had hunted human quarry, said to himself, "What possible right have I got to administer that sort of suffering to an animal for my own pleasure?"

So the killer became the protector. The energy which had been devoted to destruction was rapidly switched to conservation. Having formed the idea of a wildfowl sanctuary, Peter Scott chose Slimbridge as the ideal site. He says the choice was natural in view of the birds to be found there. Perhaps, also, it was natural for a tough man with a tender core to choose the place of his conversion as the site of expiation.

Scott's small friend is a horned frog from Argentina. He claims to have one of the world's best moth collections and keeps them in a "greenhouse."

A window on nature's world

At any rate, Slimbridge is now his home—and a wildfowl sanctuary. Outside his picture window is an artificial pond where several hundred Bewick's swans come each winter. These monogamous birds are all identified by small variations in their face markings. They are each named (Major and Ethel, Owl and Pussy Cat, Lancelot and Victoria), and their personal and family histories are lovingly recorded by the watchers at the window.

Beyond the house and the pond, the grounds of the trust hold a large collection of all manner of penned and pinioned fowl, and there are more ponds where wild birds come and go at will. Now half a dozen similar sanctuaries have been built or planned across the country.

Peter Scott is director of the Wildfowl Trust. He is

also vice president and chairman of the Trustees of the World Wildlife Fund. He is chairman of the Survival Service Commission of the International Union for the Conservation of Nature and Natural Resources, and the Fauna Preservation Society. He is also a member of the International Ornithological Committee. Some people concerned with these affairs profess a vague uneasiness at finding his name at or near the center of every major conservation group and suspect that he is somehow plotting to take over the world of natural history.

But they don't understand the man who, near the age of 50, discovered gliding, decided that he must become National Gliding Champion and who became just that in his 54th year.

Peter Markham Scott needs to be better than good at everything he undertakes. There is nothing sinister about it. He doesn't want power. He just wants to still a fear that has dogged him all his life. If you ask him about it he sums it all up in a wonderfully artless fashion. "I hate the idea," he says, "of not being thought a good chap."

Peter Scott feeds a pair of nene (Hawaiian geese) at Slimbridge. When the birds were nearly extinct he was sent three, now has raised 480.

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Two million years are added to history of Man

From a rewarding location in Ethiopia comes much the earliest evidence yet of the antiquity of our human ancestors

Every so often another door is opened in the long corridors of time, and a little more light is shed on the shadowy origins of Man. In recent years most of these sudden flashes have resulted from the discovery of manlike remains in the fossil beds of Africa. For example, the finds of Louis S. B. Leakey and his wife Mary in the Olduvai Gorge pushed the history of Man back to at least 1.75 million years ago.

Now comes another exciting leap backward. In the summers of 1967 through 1969 expeditions headed by F. Clark Howell, professor in the Department of Anthropology at the University of Chicago, found two fossilized jawbones, more than 50 loose teeth and portions of a skull in the Omo Valley of Ethiopia. They were the remains of some type of hominid, a creature not quite ape and not quite Man. Further study has shown that they probably come from two species of australopithecines, a hominid group on the lower rungs of the evolutionary ladder.

What makes the finds especially important is the very great age of the fragments. The jawbone shown at the right (much enlarged, of course) has been dated to about two million years ago. It was discovered by an Ethiopian worker who thought it was the jaw of a pig. But Howell describes it as the "mandible of a very robust australopith," probably *Australopithecus boisei,*

This jawbone belonged to a hominid who lived in the Omo Valley 1.9 million years ago.

This 3.5-million-year-old tooth may have come from *Australopithecus africanus,* whose conjectural portrait is on the wall opposite.

whose remains have also been found at Olduvai. Even more startling is the age of the well-worn molar above, which resembles the teeth of *Australopithecus africanus,* first found in South Africa. Through study of the fossil bed and radiometric measurement it can be accurately dated to 3.5 million years ago. This makes it the oldest remnant of a hominid yet found anywhere, although there are reports of a jawbone discovered in East Africa that may prove to be of almost equal age. For the moment, however, this tooth holds the title.

In any case, the Omo Valley is almost certain to yield further discoveries. Paleoanthropologists have known since the turn of the century that it was an area potentially rich in fossils, but it is only in the last few years that any serious attempt has been made to explore it. Since it is in a remote corner of the country and notorious for its armed bandits and cattle rustlers, the Ethiopian government in the past has not been prepared to guarantee the safety of visiting scientists. A few years ago, however, Emperor Haile Selassie encouraged the formation of a combined French-American expedition in this area. The French contingent is sponsored by the Muséum National d'Histoire Naturelle in Paris, and the U.S. group is headed by Dr. Howell.

The Omo Valley is a fossil hunter's paradise. The fossil beds are nearly 2,000 feet thick. Hominid and animal fossils occur in abundance throughout all the layers, which are between 2 and 4 million years old. The uppermost layers begin at a point in time where the lowest layers at Olduvai Gorge end. Furthermore, the area is so heavily eroded that most of the layers are exposed, and the fossil remains found so far have been lying on the surface. They have been discovered simply by walking back and forth, back and forth, across these African badlands.

The great significance of the Omo Valley lies in the fact that its deposits bridge an important era in geological time—from the early Pleistocene (say 2 million years ago) back to the late Pliocene (3 to 4 million years ago). This was a period of relative warmth before the onset of the glaciers. The finding of australopithecine remains from this era demonstrates, in Howell's words, "a substantially longer evolutionary history for this distinctive creature than was suspected." More than that, the fact that two species of australopithecines appear to be represented suggests to Howell that two distinct forms of our human ancestors coexisted at Omo, although perhaps in separate ecological niches.

The full implications of the valley will take years to evaluate. As Howell says: "We are collecting evidence from a range of time we never knew about. We have datable deposits which we can use to identify fossils found in other parts of Africa."

In the meantime, Dr. Howell is going back to the Omo Valley this summer. Perhaps then, or next summer, or the one after, another door will be opened. We do not know how old Man is. But we have come a long way since 1650, when Archbishop Ussher declared—and was believed—that it all began in 4004 B.C.

—deRosset Morrissey McQuade

Dr. Howell (opposite) matches the jawbone shown on pages 52-53 to a reproduction of australopithecine skull found in Olduvai Gorge by Mrs. Leakey in 1959.

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For these artists and engineers, tomorrow started yesterday

'Explorations,' on view at the National Collection of Fine Arts, celebrates a promising alliance of art and science

"He's an architect trained as an engineer who wants to become a sculptor," says Mrs. William Wainwright of her husband, who assisted Gyorgy Kepes in creating the photoelastic floor shown on page 59. This mixture of artistic and technological disciplines is characteristic of a whole new movement that may oblige us to redefine our notion of what art is supposed to be. The Kepes-Wainwright work is currently at the National Collection of Fine Arts in Washington, where it figures in an exhibition called "Explorations."

The show is aptly named, for it takes the visitor into uncharted territory. There are huge photographs under foot and flashing on and off screens; electroluminescent tapes and neon tubes crawl and flicker against black walls; enormous shiny cushions float overhead, bobbing in the currents of air; intricate machines hum and whir (and sometimes break down); elephantine balloons inflate and deflate, going from shaped to shapeless with a gentle sigh; a tunnel lit by high-intensity sodium lamps bleaches out all color. And more, much more.

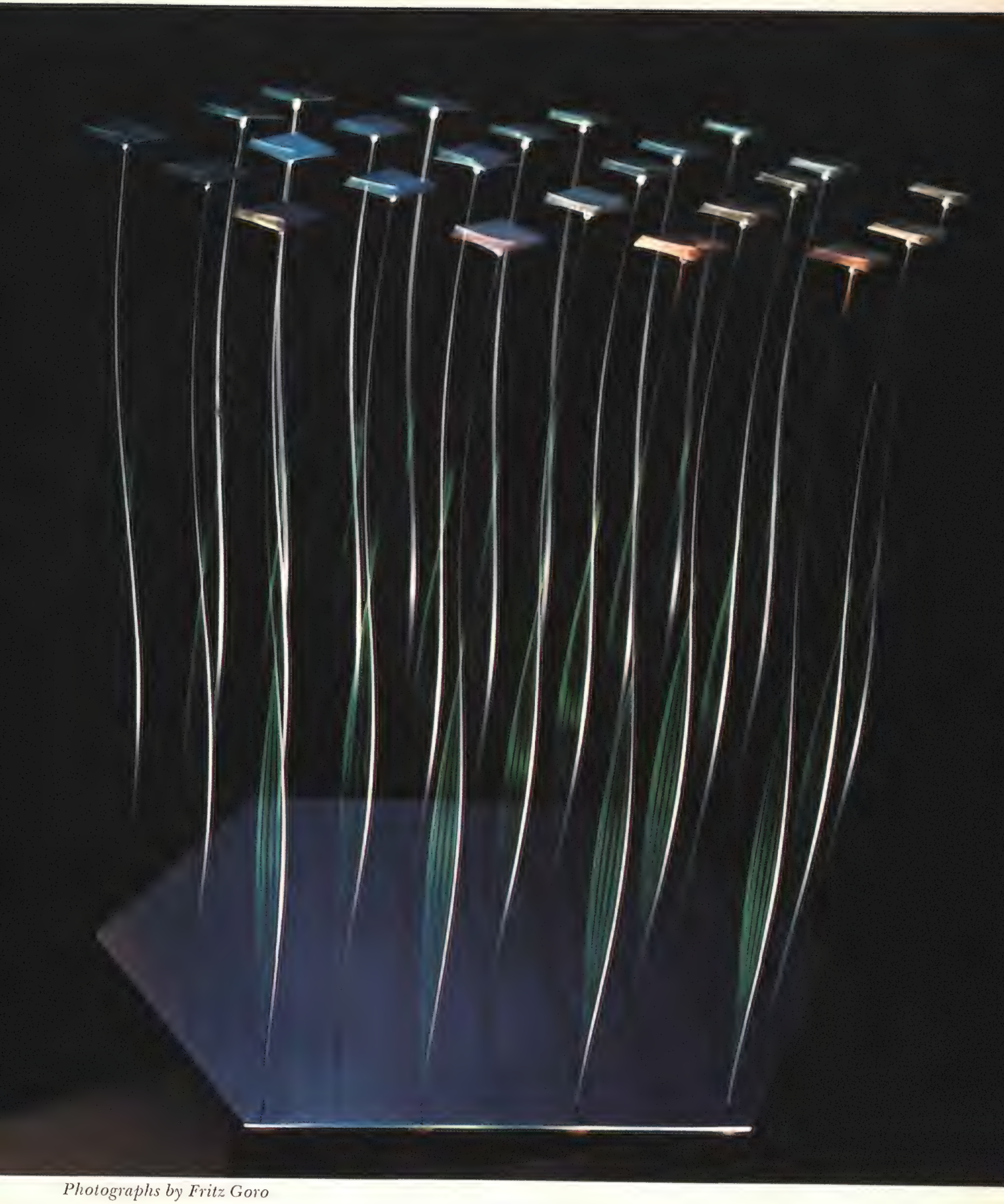
What matters here is not the individual works but the whole phantasmagoria taken together. It is the concrete expression of a still groping artistic philosophy, in which the artist joins hands with scientists and engineers to create what they envision as "the revitalization of the entire human environment."

The exhibition started early last year, when the Smithsonian's International Art Program commissioned the Massachusetts Institute of Technology to prepare a similar show as the official U.S. entry in the São Paulo Bienal, an international art competition that alternates with the Venice Biennale. Kepes, director of M.I.T.'s Center for Advanced Visual Studies, was to work with a number of Fellows at the Center in creating an "environmental community" in which no individual artist would be featured. That scheme fell apart when nine of the artists withdrew in protest against political conditions in Brazil, and U.S. participation in the Bienal was canceled. Now, something less than a year later, Professor Kepes has finally brought his concept to humming, kinetic and neon-lit life in what is termed a "double event," displayed partially at the Hayden Gallery in Cambridge and now in its entirety in Washington.

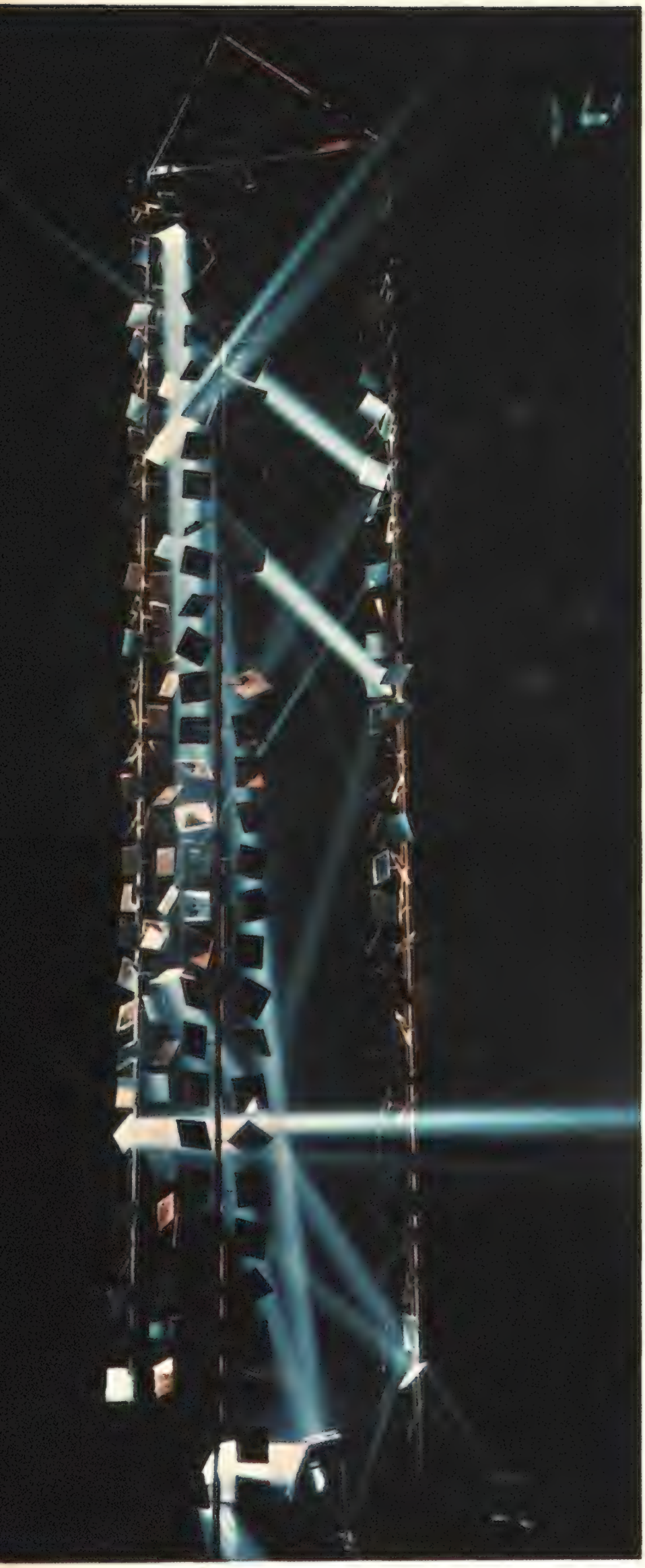
The installation is a work of art in itself, even though largely invisible. Artists, carpenters and electricians spent a month unrolling yards and yards of tape and wiring, tinkering with motors, and seeing to it that the whole complex grows out of the false floor and plastic walls without a sign of the tangled electrical spaghetti inside.

Kepes sees the artist-engineer as a new Moses who will lead mankind out of its present environmental nightmare to a higher level of ecological equilibrium, in which all creative and thinking men share an interdependence. Less visionary viewers may be unaware of such implications in the works before them, but few will miss the message: that the synthetic materials, machinery and neon lights which have so befouled our surroundings may yet be made to delight our senses.

One of the component works in Wen-Ying Tsai's *Cybernetic Sculpture System* vibrates and sparkles under a flickering stroboscopic light.



Photographs by Fritz Goro



In Morris' *Light Cage* (left) a beam of light ricochets off precisely angled mirrors to create the effect recorded in this multiple exposure.

To Wen-Ying Tsai, a component of whose *Cybernetic Sculpture System* is shown on page 57, technology is simply "a tool to express artistic intent." His oscillating rods glimmer in the light of strobes and change the rhythms of their dance in response to a handclap or sharp whistle. His objective is visual pleasure, and his mechanical sculptures have all the elegance and grace of a sea anemone.

In other works the scientist seems to lead the artist, subordinating purely aesthetic considerations to the achievement of technological breakthroughs. David Curt Morris' *Light Cage,* with its high-intensity light beam ricocheting up and down a battery of tiny mirrors, and the Kepes-Wainwright *Photoelastic Walk* (opposite), composed of fluorescent lights and polarized screens that change color when stepped on, are both only tentative models of what their creators visualize on a much more massive scale as an integral part of some future urban environment. Explorations, in short, that look ahead—in the words of Professor Kepes—"toward an art scaled to the expanding scientific-industrial urban world and revealing its latent richness." For modern man, awed and possibly even terrified by the burgeoning complexities of science and technology, this is something to think about.

The illuminated squares of *Photoelastic Walk* change color when they are stepped on. The neon tubes make up Kepes' *Vertical Rhythm.*

Stitchery: a creative art form

Once essential to every young lady's training, an old skill has been revived with new freedom of design and material

If the word embroidery brings to mind a vision of your grandmother patiently building a tight, fussy little pattern on a pillowcase or towel, you haven't seen embroidery lately. Decorative stitchery has become an imaginative art form with endless combinations of textural patterns and designs created with different yarns and stitches.

At a recent Smithsonian Associates-sponsored workshop, students were given an 18-by-24 inch rectangle of linen and six fibers ranging in texture from mohair to raffia, taught the fundamentals and, in the idiom of the day, told to do their "own thing." The results were comparable to a modern art course.

Stitchery, they learned, consists mainly of three stitches: flat or running, looped or buttonhole and the knot. Designs are created by combining these stitches in linear, banded or massed groups. Joan Koslan Schwartz, who won "Best in Show" at Stitchery '67 and Stitchery '69 was workshop instructor. She gave the class such helpful hints as, surprisingly, the proper way to thread a needle—so that the grain of the fiber goes through the fabric smoothly. Thread ends may be knotted or worked in so that there are no loose ends on the back. Who knows, when you finish you may decide you like the back better than the front.

Internal Revenue special agent, Joe Isaac, models vest and tie embroidered by Mrs. Schwartz.

Joan Koslan Schwartz selects thread for new stitch. Her needlepoint neckpiece is by Joanne Graham.

Assistant Instructor Mrs. James McFarland shows banded flat stitch, using hoop here to hold work firmly.

Mrs. Ardyce Asire watches example of next stitch. Three main stitches are the basis for most others.

A new thread is worked into her design by Mrs. James B. Kludt.

"I've never had so much fun in one day," said Mrs. George Winston.

Mrs. Douglas Schocke pulls yarn taut. Threads are about one yard long.

Book reviews

Cheer the Lonesome Traveler
Leslie Alexander Lacy (Dial, $4.50)

William Edward Burghardt DuBois (1868-1963) came as close as any man could to carrying off such a name. He was the first black militant: a loner, a fighter, a good hater. He was one of the most brilliant, egotistical and ultimately tragic figures in American Negro history.

At a time when the immensely powerful Booker T. Washington was urging conciliation, hard work and patience upon Negroes, DuBois was thundering: "No, by God, stand erect in a mud-puddle and tell the white world to go to hell, rather than lick boots in a parlor."

DuBois believed that a highly educated Negro elite—he called them "the Talented Tenth"—should lead their people to the promised land of political freedom and economic independence. Long before his time, he preached black pride, separatism and black socialism.

The mass of black people never understood DuBois as they understood and revered Booker T. Washington. DuBois feuded bitterly with Washington, Marcus Garvey and Walter White. As time passed, DuBois drifted ever leftward, lending his name to one Communist front after another, to the dismay of many friends. In 1959, he was awarded the Lenin Peace Prize. At 93 he joined the American Communist party.

W.E.B. DuBois was born on February 23, 1868, in the peaceful town of Great Barrington, nestled in the Berkshire Hills of Massachusetts. He was the son of a barber who abandoned his mother. Both parents were products of mixed marriages. DuBois boasted "a flood of Negro blood, a strain of French, a bit of Dutch, but thank God! no 'Anglo-Saxon.'" Yet he carried the New England air of intellectual arrogance. He died seven years ago in Accra, Ghana, having renounced his American citizenship months earlier.

During the 95 years that DuBois followed the intricate windings of his tortured soul, he earned varied distinctions: a Ph.D. from Harvard and professorship at Wilberforce and Atlanta Universities: a reputation as historian, poet, author of pioneering studies of the urban black, and self-styled "master of propaganda." (America, he said, was "the land of the thief—and the home of the slave.")

He helped found the NAACP which he later repudiated for being too conservative. He was a spiritual leader of the independence movement in Africa.

At a time of intense interest in black history, an objective biography of this great and complicated man should be a natural. Mr. Lacy's book does not fill the bill. Perhaps it is asking too much of black writers in these fevered and self-conscious times to treat black heroes objectively. But the author, an assistant professor at Howard University, is downright embarrassing in his adoration of DuBois: "I loved his wit, his aristocratic smile, his arrogance, his masculinity, and all the questions he was sure to ask. . . . I loved his face, brown like the African sand, changing so fast in his last days . . . a beautiful human being. . . ."

Lacy questions why DuBois became Communist so late in life, then says: ". . . for a number of reasons I had not been compelled to ask him about it."

More annoying are Mr. Lacy's ham-fisted sermonizings: "He was learning about a growing industrial civilization which was kicking his race in the face." And again, "America was no longer confused about her direction. Her violent mouth opened, and she spoke her truth: 'Prosperity to white Americans, death to the others.' She proclaimed progress more important than people." And so on.

Mr. Lacy writes well when setting a scene, but just as one is beginning to enjoy the story along come the thread-worn clichés: "It must have *blown his mind*" . . . "a society which had allowed him partially to *do his thing*. . . ."

In *Black Reconstruction* (1935), DuBois said: "I write in a field devastated by passion. . . . I want to be fair, objective, and judicial; to let no searing of the memory by intolerable insult and cruelty make me fail to sympathize with human frailties and contradiction, in the eternal paradox of good and evil. But armed and warned by all this, and fortified by long study of the facts, I stand at the end of this writing, literally aghast at what American historians have done. . . ."

Now, it appears, some black historians are doing it. DuBois deserves better.
—*Peter Chew*

The End of the Twentieth Century?
Desmond King-Hele
(St. Martin's Press, $5.95)

The future is hurtling toward us at a horribly increasing rate. Aldous Huxley wrote *Brave New World* almost 40 years ago as a vision of society some 600 years from now; yet today anybody making a list of happenings likely to occupy the short remainder of the 20th century might reasonably include baby hatcheries (at least on an experimental scale), refined techniques for community thought control, and a pleasure pill—the major elements in Huxley's fantasy.

Desmond King-Hele, in attempting to forecast what the next decades may hold in store, does offer all three *Brave New World* conceits as possibilities, and he adds to them a whole cornucopia full of the products of the straining genius of scientific Man—products which he believes may tumble into the hapless laps of a generation already born.

He claims to have set about his task in the spirit of "blind optimism so typical of our species." Otherwise, he says, nobody would trouble to read the stuff, because "everyone is irritated by continual predictions of catastrophe." Yet the book's first words ask "Will our civilization destroy itself before the year 2000?"

King-Hele is the only Englishman to have made a vital contribution to the space program. He is 43, a mathematician, a Fellow of the Royal Society, and a civil servant working in the Space Department of Britain's Royal Aircraft Es-

tablishment. He has been responsible for much of the fundamental theory of orbits and trajectories which has made it possible to send a spacecraft to within yards of a chosen target huge distances above the earth. He has also published books on Shelley and Erasmus Darwin. In short, he is a humane scientist whose ideas demand respect.

His book amounts to a spellbinding survey of most of the pivotal problems and opportunities challenging modern Man, ranging from town planning to the frailty of politicians, and from aging to atomic energy. He has danced so lightly and so rapidly across so vast a stage that nothing he touches gets more than superficial treatment, and occasionally accuracy and critical judgment falter. But to compensate for this the text is rich in references to specialized books and articles, and the story it tells is marvelous in its universality, excitement and importance. Moreover, it is all done in a most cheerful and readable manner. Which is, perhaps, strange in view of the fact that the author clearly cannot persuade himself that his species *does* possess the wisdom it will need if it *is* to see the century safely out.
—Donald Gould

A Guide to Artifacts of Colonial America
Ivor Noël Hume (Knopf, $10.00)

Horse-drawn pace or no, Colonial Williamsburg joins the 20th century in that great relaxation rite, the coffee break. In the morning, the archaeology department follows its leader, Ivor Noël Hume to the usual oasis. They sit. They sip. Then Mr. Noël Hume begins the conversation.

Any antiques dealer worth his salt glaze would covet a place at that table and a lull in the talk. "Mr. Noël Hume, I have here an old key. . . ." For few can field such queries with the know-how—and know-*when*—of Ivor Noël Hume.

Next best to a chair at his elbow is a copy of his new *Guide,* a gem of a handbook that splits the spectrum of "finds" (as London-born Mr. Noël Hume wishes we'd call our artifacts) into 44 categories from "Armor" to "Wig Curlers." Each grouping gets a mini-essay of remarkable depth: The humble nail, we learn, may divulge its age if we look for a waisted neck and discern the grain of the metal. A shard of porcelain can tell us who ruled China when the plate was new; the chart of reign marks included in the book helps to decode Chinese ideograms. And a chamber pot fairly thunders its maker's loyalties from its sides: "PRAISE GOD AND HONOUR THE KING". Like the cherry-filled bottles Mr. Noël Hume once unearthed behind Wetherburn's Tavern at Williamsburg, his essays move one to marvel so much fruit can be crammed into so little space.

Those who collect only to own will be happier with any of a hundred antiques guides. But for those who hark to what an object has to say, the author here makes of his artifacts "three-dimensional additions to the pages of history." Ivor Noël Hume constructs his books—*Here Lies Virginia; 1775: Another Part of the Field;* and the big brother to this handbook, *Historical Archaeology*—as he conducts his coffee breaks, with precision, authority and a zesty leaven of humor.
—Pat McGorum

The Thursday Evening Art World
D.H. Myers (McCall, $5.00)

This American satirist presents 18 lectures purported to have been delivered by a pseudonymous and delusive version of himself whom he calls Alfred Weary, a visitor to the country. The lectures are informed, frequently funny, civilized, gossipy, ironic and sad.

Myers' main targets are the practitioners in the fashions which followed the most innovative, exciting, productive and probably lasting movement in the visual arts that America has yet enjoyed: the abstract-expressionist explosion. It rose validly and splendidly in the late '40s and subsided around 1960.

What followed in hysterical convulsions were happenings, pop, op, minimal or reductive art, conceptual, earthworks, ecologic, environmental and even something called "nonvisual."

Because he has a genuine respect, admiration and appreciation for what good art can do for people, Myers approaches his subject with concern, also with skepticism, informed perspective and humor.

Despite a tiresome introduction, this is a literate, informative piece of work with a viewpoint, and it is at times peculiarly elegiac. That is an entirely appropriate way to be.
—Bennett Schiff

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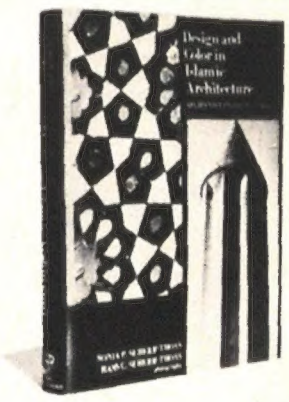

DESIGN AND COLOR IN ISLAMIC ARCHITECTURE: AFGHANISTAN, IRAN, TURKEY

by Sonia P. Seherr-Thoss
Photographs by
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Introduction by Donald N. Wilber

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Highlights

Arts and Industries Building: In addition to the resident moon rock and space hardware, an exhibition in glass craftsmanship, organized by the Toledo Museum of Art and called "Toledo Glass National," will open on May 9th. Decorative tapestries from Czechoslovakia are being shown until June 21st, and the award winners from the White House News Photographers Association annual contest are on display in this building through June 1st.

National Museum of History and Technology: "Laser 10," a special exhibition on the history and applications of laser technology during its first ten years, will continue through May, as will the special production of "Peter and the Wolf," presented by the Smithsonian Resident Puppet Theatre. The flag that flew to the moon aboard Apollo 11 has been lent to the museum and will be on display until June 1st.

National Museum of Natural History: The Armand Hammer Collection of some 100 paintings, drawings and sketches by French Impressionists and a number of other artists including Rubens, Rembrandt, Goya and Winston Churchill is being held over until May 17th.

National Portrait Gallery: The collection of the Museum of African Art will be shown here while its own building is being renovated. "Charles Fenderich: The Washington Years," a collection of lithographs of the political figures and scenes of the capital during the mid-19th century, will be on exhibit through August 31st.

National Collection of Fine Arts: The Massachusetts Institute of Technology show, "Explorations," will remain until May 10th. The show includes a multimedia "information center" with slides, films and recorded sounds to give the viewer a sense of what new materials and technology will mean to artists of the future. (See story page 56.)

Traveling Exhibition Service: Some of the Smithsonian exhibits that will appear throughout the country during May are: Willimantic, Connecticut—"Contemporary American Black Artists" (East Connecticut State College through May 31st); Carbondale, Illinois—"Mexican Folk Art" (University Museum, Southern Illinois University through May 24th); Pine Bluff, Arkansas—"View From Space" (Southeast Arkansas Arts and Science Center through May 31st); University Park, Pennsylvania—"Urban Design: Manhattan" (College of Arts and Architecture, Pennsylvania State University through May 24th); Green Bay, Wisconsin—"People Figures" (Neville Public Museum through May 24th); Dallas, Texas—"Prehistoric Paintings of France and Spain" (Dallas Public Library May 16th through June 7th).

Division of Performing Arts: The American College Theatre Festival will present ten of the best plays, chosen from those of 160 U.S. colleges, at George Washington University's new University Center Theatre and at Ford's Theatre through May 13th.

Smithsonian Museum Shops: "Botanical Prints," a one-man graphics exhibition by Henry Evans, is at the Museum of Natural History; "Vanishing America," a collection of drawings and prints from the book *The American Eye of Evelyn Curro,* is on display at the Museum of History and Technology; and "Accorsi's ABC Circus," a display of circus life, people, and animals by inventive toymaker William Accorsi, is at the Arts and Industries Building.

Smithsonian international study tours

A limited number of openings are available exclusively to members of the Smithsonian Associates for the following study tours:

Medieval Greece, July 6-27, 1970.

A tour emphasizing the Byzantine era in Greece, with visits to Kalambaka, Salonica, the monasteries of Mount Athos, and several Greek islands. Dr. Richard Howland of the Smithsonian staff, who is chairman of the Managing Committee of the American School of Classical Studies at Athens, will conduct the tour.

Decorative Arts and Textile Tour of England, September 10-October 1, 1970.

Visits to museums, private homes, estates, early wool-crafting centers and embroidery guilds, designed to give a comprehensive view of antique and contemporary English textiles, including workshops for members interested in textile techniques and stitches. Itinerary includes: Oxford, Burford, Blenheim Palace, Cambridge and Coventry. Dr. Richard Howland will conduct this tour also.

Palladian Tour of Venice, Vicenza and Verona, September 14-30, 1970.

An architectural tour focused on the work of Andrea Palladio, the creator of the late Renaissance architectural style which influenced so much of English Georgian and our own colonial architecture. The tour will be centered in Venice and Vicenza, with side trips to see public buildings and private houses in Padua, Verona and Mantua. Dr. Howland, conductor.

For further information write to Smithsonian Associates Reception Center, Great Hall, Smithsonian Building, Washington, D.C. 20560. Further study tours, both international and domestic, will be announced in subsequent issues of *Smithsonian.*

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